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Bulletin of the

UNIVERSITY OF
NEW HAMPSHIRE

1986–1987

UNDERGRADUATE CATALOG

UNIVERSITY OF NEW HAMPSHIRE

Undergraduate Catalog
1986–1987

Contents

The first half of this bulletin explains the University's General Education Requirements, honors program, and requirements for a degree; describes programs offered in the University's colleges and schools; and gives information about majors and the requirements for them. Special University programs that cut across traditional college lines are explained at the end of this first section. This first half also provides general information about admission, student affairs, and costs.

The second half of the bulletin describes individual courses. (Note explanation of arrangement on page 95.) The section concludes with a listing of faculty, as well as other items noted in the contents.

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Volume LXXVII, Number 6, April, 1986. The Bulletin of the University of New Hampshire (ISSN 8750-9040) is published eight times per year, in July, August, October, December, March, twice in April, and May by the Office of University Communications, Schofield House, Durham, N.H. 03824. Second class postage paid at Durham, N.H. 03824.

For information about undergraduate admission to the University, students should contact: **Stanwood Fish, Director of Admissions** (603) 862-1729.

For information about courses and academic records, students and former students should contact: **Stephanie M. Thomas, Registrar.**

University Calendar 1986–87

Summer Session 1986

May 26 to August 22

Semester I

August 31, Sunday
Residence halls open for freshmen

September 1, Monday
Residence halls open for upperclass students
Registration for new students

September 2, Tuesday
Registration for continuing students

September 3, Wednesday
Classes begin (classes follow Tuesday schedule)

September 9, Tuesday
Last day to withdraw and qualify for 3/4 tuition refund

September 19, Friday
Last day to add courses without dean's approval and without $25 late add fee
Last day to drop courses or withdraw without academic liability and without $25 late drop fee
Last day to choose pass/fail option
Last day to carry more than 20 credits without a surcharge

October 2, Thursday
Last day to withdraw and qualify for ½ tuition refund

October 24, Friday
Midsemester

November 4, Tuesday
Election Day—no exams can be scheduled.

November 11, Tuesday
Veterans Day holiday—no classes

November 27–28, Thursday–Friday
Thanksgiving Holiday

December 1, Monday
Classes resume

December 13, Saturday
Commencement

December 15, Monday
Reading Day—no classes

December 16, Tuesday
Final exams begin

December 20, Saturday
Final exams end

Semester II

January 18, Sunday
Residence halls open

January 19–20, Monday–Tuesday
Registration days

January 21, Wednesday
Classes begin

January 27, Tuesday
Last day to withdraw and qualify for ¾ tuition refund

February 6, Friday
Last day to add courses without dean's approval and without $25 late add fee
Last day to drop courses or withdraw without academic liability and without $25 late drop fee
Last day to choose pass/fail option
Last day to carry more than 20 credits without surcharge

February 19, Thursday
Last day to withdraw and qualify for ½ tuition refund

March 13, Friday
Midsemester

March 16–20, Monday–Friday
Spring Break

March 23, Monday
Classes resume

May 13–14, Wednesday–Thursday
Reading Days

May 15, Friday
Final exams begin

May 21, Thursday
Final exams end

May 22, Friday
Senior Day

May 23, Saturday
Commencement

Summer Session 1987

May 25 to August 14

The University reserves the right to modify this calendar subsequent to printing.

General Information

The University

History

The University of New Hampshire, founded in 1866 as the New Hampshire College of Agriculture and the Mechanic Arts, was among the early state institutions of higher education whose formation was made possible by federal government land grants to establish colleges to serve the sons and daughters of farming and laboring families.

First situated in Hanover as part of Dartmouth College, New Hampshire College moved to its present campus in Durham in 1893 after Benjamin Thompson, a prosperous farmer, bequeathed land and money to further the development of the College.

The College thrived in Durham, and in 1923 the state legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and Technology. The Graduate School was formally added in 1928. The two-year program in agriculture, which had been offered since 1895, was formally recognized in 1939 and is now the Thompson School of Applied Science. The Whittemore School of Business and Economics was established in 1962.

In 1963, the University System of New Hampshire was created when the teachers' colleges at Plymouth and Keene were brought under the same Board of Trustees as the University. In 1969, the state legislature recognized the extended functions of the College of Agriculture, renaming it the College of Life Sciences and Agriculture, and the School of Health Studies was established as part of the University's programs. Beginning in 1971, the Division of Continuing Education was authorized to offer associate in arts degree programs as an additional approach to higher education for New Hampshire residents. In 1975 the College of Technology was renamed the College of Engineering and Physical Sciences.

In 1967, the University began providing a wide range of undergraduate and graduate studies for students in central New Hampshire through its Merrimack Valley Branch in Manchester. In 1977, the legislature designated the branch as Merrimack Valley College, the fourth campus of the University System. MVC was reincorporated into the University in 1985 as a full-standing two-year college and renamed the University of New Hampshire at Manchester.

In the 1985–86 academic year, the University had 10,559 degree candidates enrolled, including 468 in the associate in applied science program of the Thompson School and 120 in the associate in arts program in the Division of Continuing Education. In the Division of Continuing Education, 1,558 special students also were enrolled.

Academic and cultural resources of each campus are amplified through System-shared programs and facilities. Cooperative ventures among the 12 member institutions of the New Hampshire College and University Council combine public and private higher education resources.

Campus

The home of the University is Durham, near the seacoast of New Hampshire—one of the oldest towns in northern New England. The town is semi-rural and still retains traces of its colonial past.

The campus, 200 acres in size, is surrounded by more than 3,000 acres of fields, farms, and woodlands owned by the University. A stream flowing through a large wooded area in the middle of the campus enhances the natural open space among the buildings—72 for teaching, research, and service, and 36 residence halls for men and women.

University Library houses 872,015 volumes, 6,268 periodicals, 7,560 tapes and records, 2,073 cassettes, and a substantial microfilm collection. Specialized subject collections in chemistry, engineering and mathematics, biological sciences, and physics are housed in four branches administered by a physical sciences librarian and a biological sciences librarian.

Athletics-Physical Education facilities include indoor and outdoor swimming pools; tracks and courts; gymnasiums; weight training, wrestling, and gymnastics rooms; a dance studio; a number of playing fields; and an indoor ice rink.

Memorial Union Building contains student activities offices, auditoriums and meeting rooms, food services, games and craft areas, and lounges.

Paul Creative Arts Center, home of the departments of the arts, music, and theater and communication, contains two theaters and two art galleries.

Thompson Hall is the main administration building.

College Woods includes 5 miles of well-kept paths through 260 acres of woods.

The New England Center, a cooperative effort by the six state universities of New England to offer outstanding continuing education programs, provides modern facilities for adult education conferences and seminars in its residence-dining-learning center.

John S. Elliott Alumni Center, completed in 1977, houses the alumni and development offices and serves as a focal point for alumni activities and campus meetings.

The University's Computing Facilities operate virtually 365 days a year, 24 hours a day. They include large DEC 8600s, VAXs, and PRIMEs, plus numerous microcomputers.

Teaching, Service, and Research

The University of New Hampshire is committed to offering excellent educational programs and opportunities for its students. The University's approximately 570 full-time teaching faculty provide a ratio of one full-time faculty member to about 17 full-time students. Eighty-five percent of the full-time faculty hold doctoral or terminal degrees, and many have earned national and international reputations in their professional fields.

A faculty member's first responsibility is teaching students. In the tradition of the nation's land-grant

colleges, the University also encourages its faculty to contribute to the growth of human knowledge through scholarly research and service to the community beyond the campus.

Accreditation

The University of New Hampshire is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators. Specialized programs of study are also accredited by various professional organizations.

All degree programs at the University of New Hampshire are approved for Veterans Educational Benefits. Individuals are encouraged to contact the Veterans Coordinator in Thompson Hall about specific questions.

The University of New Hampshire supports the efforts of secondary school officials and governing bodies to have their schools achieve regional accredited status to provide reliable assurance of the quality of the educational preparation of its applicants for admission.

Admissions

Interviews and Campus Visits

Candidates are encouraged to contact the Admissions Office to arrange an interview with a student admissions representative. These representatives are qualified to give information about the academic organization of the University and the criteria used by the Admissions Committee in reviewing candidates, and they are best able to discuss student activities, living arrangements, and other aspects of UNH life. A professional staff member oversees each day's interview activity and is available to assist candidates with special concerns or questions. The University welcomes visitors to the campus and conducts scheduled tours. Also, frequent Saturday morning Group Information Sessions led by an Admissions Office staff member and student representatives are followed by guided tours of the campus. Please call the Admissions Office (603-862-1360) for information about dates and times.

Admissions Criteria

Admission to a bachelor's degree program is based upon successful completion of a four-year secondary school program of college preparatory coursework. Primary consideration is given to academic achievement and aptitude, as demonstrated by the quality of candidates' secondary school course selections, rank in class, recommendations, and the results of a College Entrance Examination Board Scholastic Aptitude Test. Consideration is also given to character, leadership, initiative, and special aptitudes and talents.

The choice of secondary school program and courses may limit or enhance opportunities and achievements in college. Candidates are strongly encouraged to extend their knowledge and learning skills through work in the basic academic disciplines. Most successful candidates present at least four years of English and mathematics, three years of laboratory science, and two years of social science. Successful candidates have generally completed three years of study in a single foreign language or have completed more than one year of study in each of two different languages.

Candidates are expected to pursue in greater depth those fields in which they have special interests. For example, students who plan to specialize in engineering, science, mathematics, or forestry are advised to present four years of mathematics including trigonometry, as well as laboratory coursework in chemistry and/or physics. For students planning to major in health-related disciplines, secondary school laboratory courses in biology and chemistry are strongly recommended.

Applicants who have identified academic fields of interest are asked to indicate their "prospective" majors in order that the University may evaluate their credentials in terms of their academic objectives and avoid excessive enrollments in professional programs with fixed capacities. Candidates may also apply for general admission as "Undeclared" applicants for the College of Liberal Arts, the College of Life Sciences and Agriculture, and the School of Health Studies.

Approximately 60 percent of the University students request a change in major during their undergraduate years, and most are approved. These changes are possible after a student has been at the University for a semester and has secured permission from the appropriate college dean and department chairperson. However, it is important to realize that the University cannot honor all requests for such changes; at present this is true for programs in administration, computer science, medical technology, nursing, occupational therapy, and the engineering fields.

Admissions Tests Requirements

All candidates for admission to bachelor's degree programs are required to submit the results of a College Entrance Examination Board Scholastic Aptitude Test. While achievement tests are not required, a score of 500 or higher received on foreign language achievement tests satisfies the foreign language requirement of the Bachelor of Arts degree programs. Students who have identified a specific major are encouraged to submit achievement test results relating to that major. For example, an engineering applicant could submit math and physics or chemistry test results.

Art and Music Candidates

Candidates applying to any program within the Department of the Arts (except art history) are required to submit a portfolio to the department chairperson (telephone 603-862-2190). Candidates applying for programs in the Department of Music must make arrangements with the chairperson of that department for an audition (telephone 603-862-2404). Details regarding these requirements

may be obtained from the departments or the Admissions Office.

Freshman Admission Application Deadlines

Except for early notification candidates, applications should be submitted after the first marking period grades are available and before February 1. Applications received after that date may be considered only as vacancies occur. A nonrefundable application fee, $15 for New Hampshire residents and $25 for nonresidents, must accompany the application.

Candidates who apply for regular admission by the February 1 application deadline will receive notification by mid-April. Accepted candidates are required to confirm their intention to enroll with the payment of an enrollment fee ($150 in-state, $300 out-of-state) by May 1.

Early Notification

Between September 15 and December 1, the University is willing to consider well-qualified freshman applicants who desire fall enrollment under the early notification program. While it is not necessary that UNH be the first choice college, applicants should have carefully matched their objectives with the University's offerings and feel confident that their goals could be met at UNH. The University's early notification program places no obligation on the applicant to enroll if accepted for admission. The benefits for the successful early notification applicant are an early resolution of the question of admission to the University and priority with reference to the selection of a University residence hall if the student ultimately chooses to enroll. Unsuccessful early notification applicants will be reconsidered in the regular admissions process after receipt of senior year first marking term grades. Early notification applicants must submit a regular application, secondary school record, the results of a Scholastic Aptitude Test, and a counselor's letter of recommendation. Decisions will be returned by January 15 on all early notification candidates who have observed the application deadline.

Deferred Admission

The University considers applicants for deferred admission, which enables students to reserve a space in college while taking time off from school for work or travel. The University may not be able to offer deferred admission in certain program areas, however.

Advanced Standing

The University will recognize outstanding secondary school work by means of advanced placement and credit for those who have taken enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-approved placement examinations, including the College Board Advanced Placement Tests, or through the College Level Examination Program (CLEP). Further information may be obtained from the Admissions Office.

Associate Degree Candidacy

The University accepts candidates for associate in applied science and associate in arts degree programs who have demonstrated ability and motivation for learning through secondary school achievement, work experience, and/or military service.

Both New Hampshire residents and out-of-state students may be considered for admission to associate in applied science degree programs offered by the University's Thompson School of Applied Science. Candidates applying from the senior year in high school must submit the results of a College Entrance Examination Board Scholastic Aptitude Test. Students granted freshman admission to the Thompson School are eligible for University residence hall accommodations. Two of the programs offered by the Thompson School, forest technology and civil technology, require that candidates present a minimum of two years of college preparatory mathematics (see also Thompson School chapter).

The University offers an associate in arts degree program through the Division of Continuing Education. While this program is available to both New Hampshire residents and out-of-state students, associate in arts degree candidates are not eligible for University residence hall housing because of space limitations (see also Associate in Arts chapter).

For information concerning associate in arts and associate in science degrees offered through the University of New Hampshire at Manchester, see page 90 of this bulletin or contact the University of New Hampshire at Manchester, 220 Hackett Hill Road, Manchester, N.H. 03102 (603-668-0700).

Eligibility for Degree Candidacy

Applicants who meet the appropriate requirements for admission may become candidates for any undergraduate degree offered by the University. However, applicants having a degree will not be admitted into a program of study that awards the same degree (e.g., B.A., history, and B.A., zoology). Applicants may, however, be admitted into a program awarding a different degree (e.g., B.A., history, and B.S., biology; or B.A., history, and A.A.S., business management).

Readmission

An undergraduate who withdraws, does not register for UNH coursework in a given semester, or is suspended or dismissed from the University thereby terminates degree candidacy and must apply for readmission by the following deadlines: fall semester, July 1; spring semester, November 1. A nonrefundable application fee of $15 must accompany this application. Before seeking readmission, suspended students must remain away from school for at least one semester. The applications of suspended students are referred to the appropriate

college dean and should include evidence that the applicant is ready to resume University work. Only under extraordinary circumstances will students be readmitted after having been dismissed for academic reasons. Applications submitted by dismissed students must be reviewed by the University's Academic Standards and Advising Committee. Students applying for readmission should realize that it may not be possible to enroll in certain programs that have established enrollment limitations, and no assurance can be offered that University housing will be available.

Transfer Students

The University will consider qualified candidates desiring to transfer from approved institutions. Transfer credit is awarded for courses that have been completed with a grade above the lowest passing grade, provided those courses are comparable to courses offered at the University of New Hampshire. Formal transfer credit evaluations are provided only to applicants who have had their admission approved.

The University encourages competent applicants who have valid and legitimate reasons for desiring a transfer to UNH; however, it cannot encourage applicants with a history of academic or personal difficulty. Students who have encountered such difficulty are usually better advised to return after an appropriate period to their former college and improve their records before attempting to transfer.

Students enrolled in one of the University's associate degree programs who desire admission to a bachelor's degree program at UNH must apply as transfer students through the Admissions Office. A recommendation from the associate degree adviser is also required.

Transfer applicants should realize that it may not be possible to enroll in certain programs that have established enrollment limitations, and no assurance can be offered that University housing will be available.

Students desiring to transfer for the fall semester must complete application procedures before March 1; for spring semester, by November 1.

No portion of students' grade-point averages may be transferred; that is, external averages will not be calculated in the ones earned by students after entering UNH.

New England Regional Student Program

The University participates in the New England Regional Student Program of the New England Board of Higher Education, in which each state university in New England offers a number of regional curricula at the undergraduate level to students from other New England states. Under this program, students receive preferential admission consideration and, if admitted, pay the UNH in-state tuition plus 25 percent. Students must indicate on the application the specific approved curriculum for which they are applying. Information about the curricula may be obtained from the New England Board of Higher Education, 45 Temple Place, Boston, Mass. 02111; or phone (617) 357-9620.

Special Student Status

UNH offers the special student classification for persons who wish to participate in University coursework without entering degree programs. Special (nonmatriculated) students register for coursework through the University's Division of Continuing Education and are usually restricted to part-time study (maximum of 11 semester hours) unless permission is granted by the Admissions Office to exceed this limit. Special students have full access to the academic counseling services of the division and should realize that their continuing participation in University coursework is predicated upon satisfactory achievement. Special students who subsequently become degree candidates may find that those courses taken under the special student classification cannot be applied toward the residence requirement for the degree.

Rules Governing Tuition Rates

All students attending any division of the University of New Hampshire in any capacity shall be charged tuition at a rate to be determined by their domicile. Those domiciled within the state of New Hampshire shall pay the in-state rate. Those domiciled elsewhere shall pay the out-of-state rate.

Students are classified as residents or nonresidents for tuition purposes at the time of admission to the University. The decisions, made by the director of admissions, are based upon information furnished in students' applications and any other relevant information.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents have been legally domiciled in New Hampshire continuously for a period of at least twelve months immediately prior to registering for the term for which the students are claiming in-state status. Students admitted from states other than New Hampshire or from foreign countries are considered nonresident throughout their attendance at the University unless they have acquired bona fide domicile in New Hampshire.

If students maintain residency apart from that of their parents, they must clearly establish that they are financially independent and that their residence in New Hampshire is for some purpose other than the temporary one of obtaining an education at the University. To qualify for in-state status, students must have been legally domiciled in New Hampshire continuously for a period of at least twelve months prior to registering for the term for which in-state status is claimed.

The burden of proof in all cases is upon the applicants. The University reserves the right to make the final decision concerning resident status for tuition purposes.

A copy of the University's rules governing tuition rates may be obtained from the Admissions Office.

Student Affairs

The Division of Student Affairs has major responsibility for student life on campus and provides a broad range of student services and programs to supplement the University's academic curriculum.

Division offices include Dean for Student Affairs; Student Affairs Allied Programs; Dean of Students; Residential Life (residence halls and family student housing); Dining Services; Student Activities (Memorial Union); Financial Aid; Health Services; the Counseling and Testing Center; and the Career Planning and Placement Service.

Student Affairs Allied Programs Office

The staff of the Student Affairs Allied Programs Office presents the professional performing arts, administers campus judicial affairs, advises fraternities and sororities, coordinates parents' programs, initiates grant requests, and publishes the *Student Handbook* and semester-opening papers. The handbook includes statements of privacy rights as required by the Family Educational Rights and Privacy Act of 1974.

Performing Arts Well-known artists perform regularly on the Johnson Theater stage in two series presented annually—the September Arts Festival and the UNH Celebrity Series. The performing arts at UNH are recognized as an important part of undergraduate education and programs are frequently incorporated into classwork. Among the artists who appeared during the 1985-86 academic year were the New Hampshire Symphony Orchestra, the Syracuse Stage Company in *Cyrano de Bergerac,* the Beaux Arts Trio, violinist Pinchas Zukerman, the Acting Company in *As You Like It,* the King's Singers, and the Ohio Ballet.

Dean of Students Office

The Dean of Students Office has a working knowledge of all University policies and procedures and interacts regularly with students, staff, faculty. The following areas of responsibility fall within the office: Freshman Orientation, Training in Academic Skills Center, the Fireside Program (learning programs set in vigorous outdoor environments), American and Canadian exchange programs, women's issues, international students, nonacademic policies and procedures, Handicapped Services, the Non-Traditional Student Program, University Child Care Information and Referral Services, and the Commuter/Transfer Center. Students and others are encouraged to contact the Dean of Students Office whenever they have a question, concern, or problem about University life

Handicapped Services Students with a physical or mental disability that limits one or more major life activities, such as walking, seeing, hearing, speaking, working, or learning, are encouraged to inform the Office for Handicapped Services, Room 200, Memorial Union Building, of the enabling accommodations they require.

The University encourages disabled members of its community to use existing services and to become involved in the mainstream of campus life. Inquire through the Office for Handicapped Services for information about priority scheduling, accessible classrooms, special parking arrangements, assistance in securing academic aides, accessible on-campus transportation, reading services, interpreters, and other special arrangements.

Commuter/Transfer Center The Commuter/Transfer Center, located in the Memorial Union, helps commuters and transfers with off-campus living. The staff will answer questions about renting, area landlords, consumer issues, and other commuter-related problems. Lists of available rental houses, apartments, rooms, and names of people looking for roommates are published weekly.

Other services include Transfer Orientation, roommate file box, Housing Work/Exchange Program, car pooling assistance, a ride board, baby-sitting pool for student parents, intramural signups and information, commuter adviser program, etc. Typewriters, calculators, jumper cables, and dictionaries are available for student use.

The UNH Mediation Project, located in the Commuter/Transfer Center, provides mediation services to full-time commuter students, resident hall students, and residents of both Forest Park and the undergraduate apartment complex, and to landlords renting to full-time students. Mediation is a voluntary process and an alternative to court proceedings. Typical examples of problems that are appropriate for mediation include security deposits, roommate disputes, disagreements about subletting, and property damage.

Training in Academic Skills (TASk) Center The TASk Center offers a comprehensive program of academic-related services to all undergraduate students. Participation in the program enables students to work on an individual basis with a trained staff person to improve study skills and learning techniques. In addition to the study skills instruction, services include reading assessment, course information, clarification of academic goals, personal advising, and referral. Additional services such as subject area tutoring, individualized reading assistance, and graduate school preparation and advising are available to eligible students through the federally funded Special Services Program. For more information, contact the TASk Center.

Non-Traditional Student Center Someone who returns to UNH after years away from formal education is referred to as a non-traditional student. A center designed to help these students deal with their special needs is located at Underwood House, 17 Rosemary Lane.

Child Care Information and Referral Information about Seacoast area child care and assistance in finding appropriate care is available at the Non-Traditional Student Center in Underwood House, 862-3647.

Residential Life

The Department of Residential Life is committed to providing a living environment that maintains high standards of health and safety and a learning environment that supports the total educational experience.

Undergraduate University housing is limited to full-time degree candidates; associate in arts degree and Division of Continuing Education students are not eligible for on-campus housing. Students are not required to live on campus. University housing is not guaranteed for the full four-year undergraduate period.

Applications for housing are sent to accepted freshmen and must be returned with the $200 housing deposit. Freshmen are guaranteed housing as long as the specified housing application deadline is met. Transfer and readmitted students are not guaranteed housing. However, they are encouraged to place their names on the housing waitlist with the Department of Residential Life.

The University reserves the right to adjust room and board charges and policies when necessary; however, such adjustments will be announced as far in advance as possible. For more information, contact the Office of Residential Life.

Dining Services

University policy requires that all undergraduate students living in traditional residence halls purchase a 13- or 19-meal (weekly) dining plan and take their meals in UNH dining halls.

The dining halls offer a broad range of menu selections, meeting the diet requirements of most students. A student with unusually restricted menu requirements due to medical prescriptions or religion should ask Dining Services if these special needs can be met by dining hall menus.

Residence halls are not equipped for meal preparation. Students who prefer to prepare their own meals should seek living accommodations with full kitchen facilities off campus or, if eligible, in the undergraduate apartment complex. Students living off campus or in the undergraduate apartment complex may purchase a 19- or 13-meal plan, 5-lunch plan, or a 35-meal commuter meal plan. Single meals may be purchased in the dining halls by students and their guests. For more information, contact the Dining Services office.

Student Activities/Memorial Union

The Office of Student Activities in the Memorial Union serves as the center for student organizations and related activities. It provides a wide variety of services and programs for the entire University community.

Student Activities Serving as a programming resource for students and other members of the community, the office provides administrative coordination for campus-wide events and operates the Memorial Union as an integral part of the University.

Students participate in approximately one hundred recognized organizations, each with special interests, which include academics, politics, religions, careers, service, and social fraternities and sororities. Staff support is available to students in developing a new organization, leadership, programs, and activities. A Student Activities Fee, determined by the Student Senate, provides funds for: *The New Hampshire,* the student newspaper; WUNH-FM, the student radio station; *The Granite,* the UNH yearbook; the Student Television Network; Student Senate; Student Press; Cool-Aid, the campus crisis referral service; Women's Center; and two programming organizations, the Memorial Union Student Organization (MUSO) and the Student Committee on Popular Entertainment (SCOPE); and other organizations. Additional funds are available on request to other organizations for special programs.

Programs range from lectures, concerts, films, and educational seminars to special events like Parents' Weekends, Homecoming, the Christmas Crafts Fair, Winter Carnival, and spring dances.

Memorial Union As the University's community center, the Memorial Union serves as the focus for student programs and provides services for the entire University community. Students, faculty, and staff on the Memorial Union governing board work with the director to set policies for the operation of the building and those student activities related to the building. Building services include the University Information Center and Ticket Office, the Cat's Closet Store, a scheduling office for room and facility reservations, and a food service operation consisting of a cafeteria, Pistachio's Sweet Shoppe, pub, and catering service. The games area on the lower level of the building has candlepin bowling lanes, pool and billiard tables, pinball machines, and table tennis tables. The Commuter/Transfer Center and lounge provide a focal point for commuter students.

Health Services

The University Health Services located in Hood House provide comprehensive primary health care, including: laboratory examinations, X rays, physical therapy, pharmacy services, and limited mental health care. Both inpatient and outpatient care are available. The staff maintains close relationships with other specialists in the area to whom they may refer patients when medically indicated. Three well-staffed and equipped community hospitals are located nearby, and an emergency ambulance service is available in Durham at all times.

During the regular academic year, the Health Service is staffed by full-time physicians, registered nurse practitioners, nurses, and part-time consultants. Appointments with physicians and nurse practitioners may be made upon request. An appointment is not necessary for medical problems requiring immediate attention; such cases are treated through the outpatient clinic on a walk-in basis.

A mandatory health fee is assessed all undergraduate and graduate degree candidates and all full-time non–degree candidates. The academic year 1985–1986 health fee was $128. Payment of the fee entitles the student to unlimited visits to Health Services physicians, nurse practitioners, and clinic nurses; unlimited routine X rays and laboratory procedures performed at Health Services; health educator visits; cold clinic self-care medicines; the first $50 of off-campus laboratory work when it is ordered, and the specimen is collected, by a Health Services staff member for transmittal to the Health Services laboratory contractor; medicines for treatment of acute illnesses and injuries if the medicine is stocked in the Health Services pharmacy; family planning services; physical therapy; one visit to the orthopedic consultant each semester; one physical examination except for routine exams without specific purposes; and one day inpatient care in the infirmary each semester.

Services not included under the health fee are: medicines for treatment of chronic illness; X rays performed outside of the Health Service; off-campus laboratory tests performed by the Health Service laboratory contractor in excess of the first $50 and laboratory tests performed in any other laboratory (e.g., Wentworth Douglass Hospital, Leary Lab, etc.); contraceptive devices or medicines; emergency room visits or visits to any other health care facility or person, including physician office visits and emergency room visits ordered by the Health Services staff. An optional student accident and sickness insurance policy is available through Health Services. Its cost is moderate ($119 for a full year in 1985–86), and it covers most health care needs not covered by the health fee, including major medical payments. It is specifically designed to work in conjunction with the student health fee and may supplement or replace other insurance. It does not cover pre-existing conditions.

Health Record Requirement In order to provide effective health service, the University requires that students who have been formally accepted for bachelor's or associate degree candidacy and who register for nine or more semester credit hours must have complete medical records on file with the University Health Service. These records consist of 1) a health history to be completed by students before registration on a form provided by the University Health Service and 2) proof of measles immunization after 1968. Students wishing exemption from this requirement on religious grounds must make a written request to the medical director of the University Health Service. It is the responsibility of students to complete the form before the beginning of classes. Any students failing to submit the completed form will not be allowed to register for classes in the subsequent semester.

Counseling and Testing Center

The Counseling and Testing Center offers students, without charge, professional counseling and psychological assistance in meeting a variety of personal, educational, and vocational problems. During the regular academic year, services include individual and group counseling, vocational testing, and information on national testing programs such as the Graduate Record Examination. Counseling is available for special need or minority students, reentering women, and handicapped students. Individual clinical testing is available when indicated.

The center provides a drop-in intake system. Individual appointments are not necessary for the first visit. In addition, the senior staff provides psychological emergency consultation to Health Services 24 hours, 7 days a week during the regular academic year. When necessary, the center's staff assists with outside mental health referrals.

The staff, which includes certified, licensed psychologists and counselors, is committed to the welfare and development of UNH students. The center sponsors a variety of student-oriented activities including personal skills groups on such topics as communication, values clarification, and life planning. The staff is available for consultation with faculty, administrative staff, and parents on matters relating to the welfare of students.

All information about a student's visits to the Counseling and Testing Center is confidential and cannot be released to anyone without the permission of the student.

Career Planning and Placement Service

The Career Planning and Placement Service assists students in planning their careers and helps with eventual job placement. A number of options are provided to help students identify potential careers: a series of workshops asks students to examine their own interests, values, and abilities; a network of alumni provides interaction between students and alumni in various occupations; and an extensive library about career opportunities is available at the Career Planning and Placement Service in Huddleston Hall. Job placement opportunities are offered through an on-campus recruiting program and job notices for both summer jobs and full-time employment. The service is available to all undergraduates and graduate students; early use is encouraged.

NHCUC Job Referral Service The New Hampshire College and University Council, of which UNH is a member, funds a Job Referral Service (JRS) for students. The service may be contacted through the University's Career Planning and Placement Service.

Financial Aid

The University Financial Aid Office assists promising students who are unable to meet educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment. The financial aid issue of the *Bulletin of the University of New Hampshire* contains specific program information, and a financial aid brochure gives application procedures and deadlines.

In many communities, scholarships and loans are available locally. School principals and guidance

counselors have information about these sources of assistance, which are available both to high school seniors and adult students.

Before applicants may be considered for assistance by the University, the following forms must be submitted: the UNH Application for Financial Aid, the Financial Aid Form, a copy of parents' tax return, and a copy of student's tax return. New Hampshire applicants may obtain the application from their high schools or from the UNH Financial Aid Office. Nonresidents and transfer students may obtain the UNH application form from the Financial Aid Office and the Financial Aid Form from that office or from their local high schools. Upperclass applicants may obtain both forms from the Financial Aid Office.

Students should meet the following priority deadlines and should not wait until being admitted to the University before applying for financial aid:

Undergraduate Students: February 15

Graduate Students: May 1 (For NDSL, UNH loans, and College Work-Study; for information about other aid for graduate students, refer to the Graduate Bulletin.)

Grants and Scholarships

Admitted undergraduate degree candidates who will attend UNH on a full- or part-time basis may be considered for tuition grants and University scholarships. The basic consideration is financial need, although some scholarships are awarded on the basis of scholastic attainment, participation in extracurricular activities, or meeting specific requirements of a donor.

The University participates in the federally sponsored Supplemental Educational Opportunity Grant Program, which is designed to assist needy students who are admitted degree candidates.

Pell Grant Program

Students may apply directly to the federal government for a Pell Grant by utilizing the appropriate section of the Financial Aid Form or by completing a separate application available in the Financial Aid Office or from high school guidance counselors. Students must reapply each year for a grant.

Loan Programs

Two loan funds are administered by the University: UNH Loan Fund, and National Direct Student Loans. Admitted undergraduate and graduate degree candidates who will attend the University on an at least half-time basis may be considered for these loans. Financial need must be clearly demonstrated, and loans may be used only for educational expenses.

Most states now have higher education loan plans established by the Higher Education Act of 1965. Contact your local bank, other lender, or the Financial Aid Office for information about these loans.

Part-Time Employment

The College Work-Study Program, both academic year and summer, assists students who, as determined by the Financial Aid Office, need financial assistance for their educational expenses. Admitted undergraduate and graduate degree candidates attending at least half time are eligible for consideration.

Students who do not qualify for the College Work-Study Program may find part-time employment on or near campus.

Fees and Expenses

The cost for the freshman year at the University averages about $6,700 for residents of New Hampshire and about $10,700 for nonresidents.

Tuition

Tuition is $2,180 ($6,050 for nonresidents) per academic year. Undergraduates registering for 12 credits or more per semester pay the full tuition.

Students are permitted to enroll for more than 20 credits only with the approval of their college or school dean. After midsemester, persons carrying more than 20 credits will be billed a per-credit fee of $70 for each credit above 20 for resident students and $190 for nonresident students, whether or not a student has obtained the dean's approval. (No refund will be made if a student subsequently drops a course, bringing the credits to 20 or fewer.) Resident undergraduates registering for fewer than 12 credits pay $70 per credit hour, plus a registration fee of $10 per semester. Nonresident undergraduates registering for fewer than 12 credits pay $190 per credit hour, plus a registration fee of $25 per semester. The minimum charge for any recorded course is $70 for residents and $190 for nonresidents.

Students majoring in engineering (chemical, civil, electrical, mechanical) and computer science will be charged a tuition differential of $175 for both resident and nonresident students per academic year. Students in these programs (both resident and nonresident) who register for fewer than 12 credits pay a differential tuition of $5 per credit hour.

All students who are admitted to the University must pay an enrollment fee—$150 for residents and $300 for nonresidents. The enrollment fee, less $50 (to cover new student services such as orientation, preregistration, and record preparation), will be credited to the tuition bill. If a student decides not to attend the University, these payments may be refunded on a prorated basis until Aug. 15, according to the guidelines set by the admissions office.

Three-fourths of tuition charges will be refunded to students withdrawing or dropping courses within one week of registration; one-half after one week and within 30 days; and none thereafter. (See University Calendar, page 5.) A degree candidate who withdraws from UNH and subsequently enrolls as a special student within the following year will be billed for tuition and fees on the same basis as degree candidates. Students with outstanding financial obligations to the University must clear their accounts before their registration will be confirmed.

A $25 fee must be paid by all students dropping courses after the third Friday of classes. The $25 fee will not be charged to persons changing to a reduced load or withdrawing; in both of these cases, the regular tuition rebate policy will apply. If a student has received permission to add a course after the third Friday of classes, a $25 fee will be assessed for each course added. A change of section within the same course is accomplished by a "drop" of one section and an "add" of another; however, only one $25 fee is assessed under these circumstances.

Fees

Required fees for 1985–86 included a Memorial Union assessment fee ($75) for the use and administration of the student union; a recreation and physical education fee ($36) for the use of recreational facilities; a student activity fee ($57) for support of the undergraduate newspaper, yearbook, student government, student lawyer, student radio station, and other student organizations; a student services fee ($24) to provide partial support for programs provided by the Division of Student Affairs; a health fee ($128) to provide general health care through the Hood House infirmary.

There are no waivers or refunds of these fees. The services and facilities are available to all—the extent to which each student uses them cannot be the factor by which assessment is determined.

An optional student season-athletic ticket may be purchased for $50. Optional student accident and sickness insurance is available for all degree candidates and full-time nondegree candidates. Participants in intercollegiate athletics are required to purchase the student accident and sickness insurance or demonstrate proof of comparable insurance to the respective athletic department. The 1985–86 cost for student accident and sickness insurance was $119 for a full calendar year.

Room and Board

Housing charges average $1,446 per academic year.

Students applying for a room on campus must include a $200 prepayment fee with the housing application. Written notification of cancellation of the room application or assignment received before August 15 will result in forfeiture of the fee only. Written notification of cancellation after August 15 and before closing Registration Day, however, will result in a charge of one-fourth of the full semester's room rent. If students fail to occupy assigned rooms by one day after Registration Day, their Room Agreements will be canceled and the students charged for one-half of the full semester's rent. Written notification of cancellation of room received by the Office of Residential Life after Registration Day and within 30 days from Registration will result in the students' being charged for one-half of the full semester's rent. For cancellation of room 30 days or more after Registration, students will be charged for the full semester's rent.

Refunds on board plans will be granted only on approved waivers or withdrawal from the University. Cancellation of a meal plan before Registration Day will result in a 100 percent refund; after Registration Day but before the end of the first week of the semester, 75 percent refund; and after the end of the first week but before the end of the fourth week, 50 percent refund. Refunds after the fourth week through the end of the twelfth week will be based on the remaining food cost portion of the meal plan. No refunds will be made after the end of the twelfth week. Generally, rebates will not be allowed for missed meals except in the case of illness.

Rebates

Any amount owing to the University will be deducted from any rebate due to a student.

Deposits and Course Fees

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of applied music courses. A charge will be made for riding lessons and scuba, as noted in the sections on animal sciences and physical education, and for field trips of the Thompson School and family and consumer studies. Students will be charged a computer use fee for courses requiring computer access and/or common access accounts. For certain courses, there are also lab fees.

Other Expenses

Books and classroom supplies cost approximately $350. These may be purchased at the University Bookstore.

Personal expenses average $1,000. These will vary with the needs of individual students and include clothing, laundry, recreation, incidentals, and travel.

Payment

All bills, including those for room and board in University buildings, are due and payable in full on or before Registration Day for each semester.

Parents and students who wish to make periodic payments should consult their local banks or other financial institutions that provide programs for budgeting educational expenses.

Fees and Expenses (1985–86)*	N.H. Residents	Non-Residents
Tuition	$2,180	$6,050
Room (average)	1,446	1,446
Board (19 meals/wk.)	1,168	1,168
Activity fee	57	57
Recreational/physical education fee	36	36
Memorial Union fee	75	75
Student services fee	24	24
Health fee	128	128
Books, class supplies	350	350
Total	$5,464	$9,334
Individual expenses	1,000	1,100
Athletic admissions ticket (optional)	50	50
Health insurance (optional)	119	119

*The University reserves the right to adjust charges for such items as tuition, board, student fees, and room rent. Such changes will be announced as far in advance as feasible.

University Academic Requirements

General Education Requirements

To be graduated from the University of New Hampshire, students must fulfill three types of requirements: University (General Education), degree, and major requirements.

In addition to the particular requirements for specific degrees, all candidates for a bachelor's degree must obtain a passing grade in a minimum of 128 credits in courses numbered 400–799, must maintain a cumulative grade-point average of at least 2.00 for all courses taken at the University in which a grade is given, and must successfully meet, as soon as possible in their University careers, the following General Education Requirements:

*1. One course in writing skills
*2. One course in quantitative reasoning
3. Three courses in biological science, physical science, or technology, with no more than two courses in any one area
4. One course in historical perspectives
5. One course in foreign culture
6. One course in fine arts
7. Two courses in social science or philosophical perspectives
8. One course in works of literature and ideas

*must be taken during a student's first year

These required courses shall not be waived on the basis of special examinations or placement tests, and cannot be taken on a pass/fail basis. No single course may be counted in more than one general education category. Academic departments may or may not permit general education courses to count toward requirements for a major.

The specific courses that fulfill each category of the General Education Requirements are printed below.

1. Writing Skills

Engl 401

2. Quantitative Reasoning

Admn 424
C S 410
Econ 525
Math 419, 420, 425, 536
Phil 412, 550
Psyc 402
REco 528
Soc 502

3. Biological Science, Physical Science, and Technology

Biological Science
ANSc 401
Bchm 501
Bot 412
Ento 402
HAP 501
Micr 501-502
PlSc 421, 535
Soil 502
Wild 533
Zool 412, 507, 508

Physical Science
Chem 401-402, 403-404, 405, [409]**
ESci 401, 402, 409, 501
FoRs 504
Phys 401-402, 406, 407-408
Soil 501

Technology
Ci E 520
C S 406
E E 405, 431, 432
E C 635
M E 401
Phil 447
Tech 583

4. Historical Perspectives

Engl 515
Hist 400, [402],** 421, 435, 436, 510
Milt 525
Polt 403, 508

5. Foreign Culture

Anth 411, 500, 512, 515, 519
Engl 581
Fren 503, 504, 525
Geog 401, 402
Germ 503, 504, 525
Grek 503, 504
Hist 425, 563
Ital 503, 504
Japn 503, 504
Latn 503, 504
Polt 557
Russ 503, 504, 525
Span 503, 504, 525, 526

6. Fine Arts

Arts 431, 432, 485, 487, 570, 571, 572, 573, 597
Musi 401, 402, 511
Phil 421
ThCo 435, 436, 438, 450, 457, 461, 462, 463, 583, 638

7. Social Science/Philosophical Perspectives

Anth 518, 625
C D 507
Econ 401, 402
Educ 410
Engl 505, 521, 523
FCS 525
Geog 581, 582
HAP 401
Huma 650
Ling 505
Nurs 670
Nutr 405
Phil 401, 417, 424, 435, 436, 530, 630, 660
Polt 401, 402, 521, 560
Psyc 401
REco 411

S S 525
Soc 400, 500, 520, 530, 540
ThCo 402, 455
W S 401

8. Works of Literature and Ideas

Clas 511, 512
Engl 513, 514, 516, 518, 519, 585, 586, 631, 657, 685
Fren 651, 652
Germ 521
Huma 401, 501, 502, 503, 595, 651
Phil 570, 572, 573, [600]**
Psyc 571
R S 416
Russ 521

**Bracketed courses satisfy General Education Requirements only if taken after September 1, 1985.

Grades and Grading Symbols

Instructors assign grades as listed below; grade points per semester hour are indicated in parentheses. For all undergraduate courses, grading standards established by the Academic Senate are that a C indicates competent, acceptable performance and learning; B indicates superior performance and learning; and A indicates excellent performance and learning. These standards apply to all undergraduate courses, instructors, departments, subjects, and colleges. The University reserves the right to modify grading and honors practices.

A (4.00)	Excellent
A− (3.67)	Intermediate grade
B+ (3.33)	Intermediate grade
B (3.00)	Superior
B− (2.67)	Intermediate grade
C+ (2.33)	Intermediate grade
C (2.00)	Satisfactory, competent
C− (1.67)	Intermediate grade
D+ (1.33)	Intermediate grade
D (1.00)	Marginal grade
D− (0.67)	Intermediate grade
F (0.00)	Failure: academic performance so deficient in quality as to be unacceptable for credit
AF (0.00)	Administrative F (usually indicates student stopped attending without dropping the course); is included in grade-point average
Cr	Credit: given in specific courses having no letter grades, designated credit/fail
P	Passing grade in a course taken under the student pass/fail grading alternative
W	Withdrawal—assigned if withdrawal is later than third Friday of classes; is not included in grade-point average
AU	Audit—no credit earned
IC	Grade report notation for student's incomplete coursework
IA	Indicates "incomplete" in a thesis or continuing course of more than one semester; the grade earned will replace "IA" assigned in previous semesters
IX	Grade not reported by instructor

Students earning a semester or cumulative grade-point average less than 2.00 are placed on "academic warning."

Pass/Fail While earning a bachelor's degree, students may choose the pass/fail grading alternative for a maximum of 4 credits per semester up to a total of 16 credits.

Pass/fail cannot be used for General Education Requirements, for courses required by a student's major or second major, for option or minor requirements, for Engl 401, or for repeated courses. In addition, B.A., B.F.A., and B.M. degree candidates may not use pass/fail for courses taken to meet the foreign language requirement, and no Whittemore School course may be taken on a pass/fail basis by a student majoring in administration, economics, or hotel administration.

The minimum passing grade for credit is a D− (0.67); any grade below this minimum is a fail. All grades will be recorded on the grade roster as A, B, C, D, F, or intermediate grades. The pass/fail marks will be placed on students' transcripts and grade reports by the Registrar's Office. The course will not be included in the grade-point calculation, but the pass or fail will be recorded, and in the case of a pass, the course credits will be counted toward degree requirements.

Students may not use the pass/fail alternative to repeat a course. Associate in Arts students, see page 88.

Honors An undergraduate degree student, after completion of at least 12 graded semester hours in University of New Hampshire courses, will be designated as an honor student for a given semester if the student has: a) completed at least 12 graded semester hours for that semester and earned at least a 3.20 semester grade-point average; or b) earned at least a 3.20 cumulative grade-point average and at least a 3.20 semester grade-point average regardless of the number of graded credits that semester. These categories will be used: 3.20 to 3.49 (honors), 3.50 to 3.69 (high honors), and 3.70 to 4.00 (highest honors).

Bachelor's degree candidates who have earned honors for their entire work at the University will be graduated with honors based on the final cumulative grade-point average, provided that a minimum of 64 graded semester hours have been completed in University of New Hampshire courses. The Latin equivalent of the honors classification will appear on the student's academic record and diploma. The student's honors classification will be noted in the commencement program.

Honors Program

In addition to being designated an honors student upon meeting the grade requirements specified above, a student may be invited to participate in the University-wide honors program. Successful completion of all the requirements of this program will entitle the student to receive the designation "University Honors" on his/her University record.

The University Honors Committee, made up of representatives from all colleges of the University, the Admissions Office, the Dean of Students Office, and the Registrar's Office, supervises the overall operation and requirements of the program. Participation in the University Honors Program does

not add courses to those required to graduate; rather, it substitutes ones that are more challenging.

The first two years of the program focus on General Education Requirements. All participants take a minimum of four honors-designated general education courses. Three of these are selected from courses offered by the University's undergraduate colleges. The fourth is a freshman/sophomore seminar concentrating on the theme "The Challenge of the Future." The University Honors Committee is currently working with the colleges to develop honors majors and advanced courses. Students with majors not offering honors courses will be provided with an alternative method to achieve "University Honors" upon graduation. In addition, all honors-designated coursework will be indicated on the student's transcript.

Students are invited to apply to the honors program on the basis of high school academic achievement (as reflected in their applications) or on the basis of grade-point average (which must be at least 3.20) in their first semester at UNH. A 3.20 grade-point average is the minimum necessary to remain in the program. Full tuition and partial tuition merit-based scholarships are available to a select number of incoming freshmen.

For more information, please contact Robert Mennel, director, University Honors Program, Thompson Hall, Room 209, University of New Hampshire, Durham, N.H. 03824.

Degree Requirements

Grading and honors policies as stated in this catalog apply to all undergraduate students.

Other requirements in this catalog apply to students who enter the University between July 1, 1986, and June 30, 1987. (Students who entered the University at an earlier time but who wish to change to the requirements of this catalog must apply to the appropriate office for the change.) Students will be held responsible for all work required for graduation and for the scheduling of all necessary courses.

Modifications tend to occur in major programs during the four-year period of students' undergraduate careers. Students are expected to conform to these changes insofar as they do not represent substantive alterations in their course of study.

Bachelor of Arts

1. At least 128 credits with a minimum cumulative grade-point average of 2.00 in all University of New Hampshire courses.

2. Completion of the University General Education Requirements. This is intended to ensure that all students receiving the bachelor of arts degree acquire reasonable exposure to and learning in the arts and humanities, social sciences, and natural sciences.

3. Proficiency in a foreign language at the level achieved by satisfactory work in a one-year, college-level course. This requirement may be fulfilled by achieving a score of 500 or better on a College Board foreign language achievement test, or by completing a full-year elementary course in any foreign language, or by completing a semester of a course in a foreign language beyond the elementary year. This requirement must be satisfied by the end of the sophomore year.

4. Satisfaction of major requirements by completing at least 32 credits of major coursework with grades of C− or better and a grade-point average of 2.00 or better. A major may require a senior paper or project and/or a comprehensive examination.

Bachelor of Fine Arts, Bachelor of Music, Bachelor of Science

Requirements for the B.F.A. degree are on page 37; for the B.M. degree, on page 38; and for the B.S. degree, on pages 39, 41, and 53.

Associate in Arts

1. Completion of at least 64 credit hours with a minimum grade-point average of 2.00 based on a 4.00 scale.

2. Completion of General Education Requirements as follows:

   a. one course in writing skills (no pass/fail allowed)
   b. one course in quantitative reasoning (no pass/fail allowed)
   c. one course in the biological sciences, or physical sciences, or technology (no pass/fail allowed)
   d. three courses chosen from the following, with no more than one from each category: historical perspectives; foreign culture; fine arts; social science; philosophical perspectives; works or literature and ideas (no pass/fail allowed)

The Division of Continuing Education may prescribe up to four of the six required courses used to satisfy the General Education Requirements. Courses that may be used to meet these requirements will be available from an adviser.

3. A minimum of four courses freely selected by the student.

4. The remaining courses or credits may be earned in one of the career concentrations described on page 87 and/or in elective general education courses.

5. The last 16 hours of credit must be University of New Hampshire courses completed at UNH following admission and matriculation, unless permission is granted to transfer part of this work from another institution.

Dual Degrees

The opportunity to pursue simultaneously two undergraduate degrees enhances and broadens the education of certain students. The program is only for those students who can adequately handle the requirements for two different degrees and who can reasonably allocate the additional time and effort needed for the program. Except for specific five-year degree programs (page 23), a student may not pursue two different degree levels simultaneously.

Requirements

1. Students desiring dual degrees must petition the college dean or deans involved for permission.
2. Students planning to take one degree in a highly prescribed curriculum should register as freshmen in the appropriate school or college for that curriculum.
3. It is expected that candidates for two degrees will complete 32 credits beyond those required for the first degree.
4. The two degrees, as awarded by the University of New Hampshire, must be different (e.g., B.A. and B.S., or B.S. and B.S. in Chemistry). Transfer students already holding a baccalaureate degree from another accredited institution may pursue an additional baccalaureate degree at the University of New Hampshire provided they fulfill the previously listed requirements. The degree received at the first institution will be accepted by UNH as awarded by that institution.

Supervision As soon as a student is accepted as a candidate for two degrees, the appropriate dean(s) will appoint supervisors for each of the proposed majors. The supervisors and the student will work out a basic course plan for the two degrees and inform the appropriate dual degree dean(s) of the plan. The supervisors will maintain joint control over the student's academic program. The college offices and the supervisors will receive copies of grade reports and other records for students pursuing two degrees.

Minimum Graduation Average

A cumulative grade-point average of 2.00 in University of New Hampshire courses is the minimum acceptable level for undergraduate work in the University and for graduation. In addition, some majors require a grade-point average greater than 2.00 in certain courses or combinations of courses. The Academic Standards and Advising Committee examines the records of students periodically and may place academically deficient or potentially deficient students on warning, or may exclude, suspend, or dismiss those who are academically deficient.

Quota of Semester Credits

Students registering for more than 20 credits must receive the approval of the college dean.

Undergraduates are assigned class standing on the basis of semester credit hours of academic work completed with a passing grade, as follows: to be a sophomore—26 credit hours; to be a junior—58 credit hours; to be a senior—90 credit hours.

Residence

"Residence" means being enrolled in University of New Hampshire (including UNH at Manchester) courses after admission to and matriculation in a degree program. Students who are candidates for a bachelor's degree must attain the last one-quarter of total credits for the degree in residence unless granted permission by the Academic Standards and Advising Committee to transfer part of this work from other accredited institutions.

Withdrawal from the University

Students who leave the University are expected to file formal withdrawal notification with the registrar.

Note: Although the University will try to provide sufficient facilities so that students may pursue any major or curriculum for which they meet the requirements, such a privilege cannot be guaranteed, since rapidly increasing enrollment sometimes results in the overcrowding of required specialized courses. On occasion, students may remain in a crowded curriculum if they are willing to take certain courses during the summer session.

Majors and Minors

Majors are described under their various schools and colleges, and a few that are intercollege are described in the section on "Special University Programs."

Student-Designed Majors

See page 82 for requirements for a student-designed major.

Second Majors

Bachelor's degree students may choose to fulfill the requirements of two dissimilar major programs, provided they obtain the approval of their principal adviser and the dean(s) of the college(s) in which the programs are offered, and comply as follows:

1. If the two majors are offered in different schools or colleges within the University, the admissions requirements of each must be satisfied.
2. If the two majors have two distinct degrees, e.g., B.A., B.S., or some other designated degree, students must choose which of the two degrees is to be awarded and fulfill all requirements for that degree.
3. No more than eight credits used to satisfy requirements for one major may be used as requirements for the other major.

Minors

Students may earn a minor in any undergraduate discipline designated by the University. A list of minors is available from the advising coordinator in each college or school. Students must consult with the major adviser and the minor supervisor. A minor consists of 20 semester hours with C− or better and a 2.00 grade-point average in courses that the minor department approves. Courses taken on the pass/fail basis may not be used for a minor. No more than eight credits used to satisfy major requirements may be used for the minor. Students should declare an intent to earn a minor as early as possible and no later than the end of the junior year. During the final term, an application should be made to the dean to have the minor shown on the academic record.

Abbreviations

Program Abbreviations

The following abbreviations are used to identify undergraduate and graduate courses offered at the University. An asterisk preceding the letters identifies those disciplines in which graduate programs are offered.

College of Liberal Arts

Anth	Anthropology
Arts	The Arts
Biol	Biology
Clas	Classics
*Educ	Education
*Engl	English
Fren	French
Geog	Geography
Germ	German
Grek	Greek
*Hist	History
Huma	Humanities
Ital	Italian
Japn	Japanese
Latn	Latin
Ling	Linguistics
*Micr	Microbiology
*Musi	Music
*MuEd	Music Education
Phil	Philosophy
*Polt	Political Science
Port	Portuguese
*Psyc	Psychology
R S	Religious Studies
Russ	Russian
ScSc	Social Science
S S	Social Service
*Soc	Sociology
*Span	Spanish
ThCo	Theater and Communication
W S	Women's Studies
*Zool	Zoology

College of Life Sciences and Agriculture

*ANSc	Animal and Nutritional Sciences
*Bchm	Biochemistry
*Bot	Botany and Plant Pathology
C D	Community Development
E C	Environmental Conservation
*Ento	Entomology
*FCS	Family and Consumer Studies
*FoRs	Forest Resources
Nutr	Nutritional Sciences
*PlSc	Plant Science
*REco	Resource Economics
*Soil	Soil Science
*VTAE	Vocational/Technical and Adult Education
*Wild	Wildlife Management

College of Engineering and Physical Sciences

*Ch E	Chemical Engineering
*Chem	Chemistry
*Ci E	Civil Engineering
*C S	Computer Science
*ESci	Earth Sciences
*E E	Electrical and Computer Engineering
ET	Engineering Technology
*Math	Mathematics
*M E	Mechanical Engineering
*O E	Ocean Engineering
*Phys	Physics
*Engr	Engineering Ph.D.
Tech	Technology (nondepartmental)

School of Health Studies

*Comm	Communication Disorders
HAP	Health Administration and Planning
LM T	Leisure Management and Tourism
MedT	Medical Technology
*Nurs	Nursing
O T	Occupational Therapy
*PhEd	Physical Education
SHS	School of Health Studies

Whittemore School of Business and Economics

*Admn	Administration
*Econ	Economics
Hotl	Hotel Administration
Secr	Secretarial Studies

Separate Departments and Programs

Aero	Aerospace Studies
DCE	Division of Continuing Education (all courses)
*Gen	Genetics Program
Gero	Gerontology
Inco	Intercollege
Just	Justice Studies
Milt	Military Science
TSAS	Thompson School of Applied Science
UNHM	University of New Hampshire at Manchester

Degrees and Major Programs of Study

Colleges

College of Liberal Arts

The Teacher Education division of the College of Liberal Arts coordinates the five-year graduate/undergraduate teacher education program. See page 23.

Bachelor of Arts
Anthropology
The Arts
  Art History
  Art Studio
Classics
Communication
English
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Microbiology
Music
  Music History
  Music Theory
  Performance Study
  Preteaching
Philosophy
Political Science
Psychology
Russian
Social Work
Sociology
Spanish
Theater
Zoology

Bachelor of Fine Arts
Fine Arts

Bachelor of Music
Music
  Music Education
  Organ
  Piano
  Strings, Woodwind, Brass, or Percussion
  Theory
  Voice

Bachelor of Science
Biology

College of Life Sciences and Agriculture

Bachelor of Arts
Botany and Plant Pathology
Entomology

Bachelor of Science
Animal Sciences
  Animal Production and Agribusiness
  Bioscience and Technology
  Preveterinary Medicine
Biochemistry
Biology
Botany and Plant Pathology
Community Development
Entomology
Environmental Conservation
Family and Consumer Studies
  Child and Family Studies
  Consumer Studies
General Studies
Nutritional Sciences
Plant Science
  Industry
  Science
Resource Economics
Soil Science
Vocational/Technical and Adult Education
Wildlife Management

Bachelor of Science in Forestry
Forest Resources
  Forest Management
  Forest Science

College of Engineering and Physical Sciences

Bachelor of Arts
Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics

Bachelor of Science
Chemical Engineering*
  Energy
  Environmental Engineering
Chemistry*
Civil Engineering*
  Constructed Systems
  Environmental Engineering
Computer Science*
Electrical Engineering*
  Computer Engineering
  Electrical Engineering Systems
  Student-Designed Option
Geology*
Mathematics*
Mathematics Education*
  Elementary
  Secondary
Mathematics (Interdisciplinary)
  Mathematics—Chemistry
  Mathematics—Computer Science
  Mathematics—Economics
  Mathematics—Electrical Science
  Mathematics—Fluid Dynamics

Mathematics—Mechanics
Mathematics—Physics
Mathematics—Statistics
Mathematics—Thermodynamics
Mechanical Engineering*
Energy
Physics*

Bachelor of Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology

Schools

Whittemore School of Business and Economics

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

School of Health Studies

Bachelor of Science
Communication Disorders
Health Administration and Planning
Leisure Management and Tourism
Program Administration
Therapeutic Recreation
Tourism and Park Management
Medical Technology
Nursing
Occupational Therapy
Physical Education
Athletic Training
Exercise Specialist in Health Maintenance
Outdoor Education
Sports Communication
Teacher Certification

Thompson School of Applied Science, of the College of Life Sciences and Agriculture

Associate in Applied Science
Applied Animal Science
Applied Business Management
Civil Technology
Food Services Management (and Culinary Arts)
Forest Technology
Horticultural Technology

Other Programs

University of New Hampshire at Manchester

Associate in Arts
Concentrations
Administration
General Studies
Humanities
Social Science

Associate in Science
Concentrations
Business Administration
Computer Information Systems
Sign Language Interpreting

Division of Continuing Education

Associate in Arts
Career Concentrations
Accounting
Computer Information Studies
Criminal Justice
Management
Merchandising
Pre-Engineering and Physical Sciences
Real Estate

Five-Year Degree Programs

Bachelor of Arts and Master of Business Administration
Bachelor of Science and Master of Business Administration
Bachelor of Arts and Master of Education
Bachelor of Science and Master of Education

Interdisciplinary Major

Bachelor of Arts
International Affairs

Interdisciplinary Minors†

Biomedical Engineering
Environmental Engineering
Gerontology
History and Philosophy of Science
Hydrology
Justice Studies
Materials Science
Ocean Engineering
Oceanography
Plant Pest Management
Religious Studies
Women's Studies

Advisory Committees

Genetics
Interdepartmental Biology
Prelaw
Preprofessional Health

The Graduate School

Master of Arts
Master of Science
Master of Arts in Teaching
Master of Business Administration
Master of Education
Master of Occupational Education
Master of Public Administration
Master of Science for Teachers
Certificate of Advanced Graduate Study
Doctor of Philosophy

* Designated degree (The name of the specialization is included on the diploma; e.g., B.S. in Chemistry.)
† For other interdisciplinary programs, see page 82.

College of Liberal Arts

Stuart Palmer, Dean
John T. Kirkpatrick, Assistant Dean
Arnold S. Linsky, Senior Faculty Fellow
Pauline Soukaris, Director, Academic Advising Center
David Leary, Faculty Fellow for Research Development

Divisions and Departments

Biological Science Division
Microbiology Department
Zoology Department

Humanities Division
The Arts Department
English Department
French and Italian Department
German and Russian Department
Music Department
Philosophy Department
Spanish and Classics Department
Theater and Communication Department

Social Science Division
Geography Department
History Department
Political Science Department
Psychology Department
Social Service Department
Sociology and Anthropology Department

Teacher Education Division
Education Department

Programs of Study

Bachelor of Arts
Anthropology
The Arts
- Art Studio
- Art History

Classics
Communication
English
English Teaching
French
Geography
German
Greek
History
Humanities
Latin
Linguistics
Microbiology
Music
- Music History
- Music Theory
- Performance Study
- Preteaching

Philosophy
Political Science
Psychology
Russian
Social Work
Sociology
Spanish
Theater
Zoology

Bachelor of Science
Biology

Bachelor of Fine Arts
Fine Arts

Bachelor of Music
- Music Education
- Organ
- Piano
- Strings, Woodwind, Brass, or Percussion
- Theory
- Voice

Purpose and Programs

It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help students achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and realities of the present so that they may recognize and act upon their obligations to the future.

The college seeks to meet the educational needs of each student through the development of interests and skills which, combined with the individual's potential, makes possible the living of a richer, more useful life.

Degrees

The College of Liberal Arts offers four degrees: bachelor of arts, bachelor of science, bachelor of fine arts, and bachelor of music.

Bachelor of Arts These programs primarily provide a broad liberal education along with a major in one of the fields listed on the previous page. Requirements for the bachelor of arts degree and information regarding these majors are presented on pages 17 and 26.

Bachelor of Science This curriculum consists of an interdepartmental program in biology that permits students considerable specialization while providing them with a broad cultural education. Requirements for the bachelor of science degree and information regarding the biology curriculum are presented on page 39.

Bachelor of Fine Arts This curriculum provides training for students who plan to enter a professional graduate school. Requirements for the bachelor of fine arts degree are outlined on page 37.

Bachelor of Music This curriculum provides professional training in performance, in musical theory, and in music education, and it allows students to develop their talent to a standard equivalent to the one achieved at conservatories of music. Requirements for the bachelor of music degree and information regarding the curriculum are presented on page 38.

Five-Year Program: B.A.-M.B.A. The College of Liberal Arts and the Whittemore School of Business and Economics offer a combined five-year program leading to a B.A. degree in French, history, philosophy, or psychology and an M.B.A. degree. Information about the program can be obtained from those departments or from the undergraduate counselor in the Whittemore School.

Combined Programs of Study

In addition to pursuing a single major, students may combine programs of study as follows:
Minors: See page 18 for requirements. See also Interdisciplinary Minors, pages 25, 53, and 82.
Second Majors: See page 18 for requirements.
Dual-Degree Programs: See page 17 for requirements.
Student-Designed Majors: See page 82 for requirements.
Other combined programs and interdisciplinary opportunities are described in Special University Programs, pages 81–86.

Preparing for Teaching

(For description of education courses, see page 124.)

The teacher education programs at the University are accredited by the New Hampshire State Board of Education and by the National Council for the Accreditation of Teacher Education. UNH participates in the Interstate Certification Compact; consequently, completion of the approved teacher preparation program of the University qualifies students for certification as teachers in most states.

UNH offers approved programs leading to teacher certification in agriculture, art, biology, chemistry, earth sciences, elementary education, education of the emotionally handicapped, English, French, general science, general special education, German, family and consumer studies, Latin, mathematics, music, physical education, physics, preschool education, social science, Spanish, speech therapy, speech and drama, and trade and industrial education.

N.H. State Board of Education Requirement Effective December 1, 1985, all candidates for initial New Hampshire teacher certification must pass the Pre-Professional Skills Tests (PPST) of the National Teacher Examination Program. The PPST is administered by the Educational Testing Service and consists of three separate examinations: reading, mathematics, and writing. For further information, contact Paula Dempsey, coordinator of teacher education.

Five-Year, Undergraduate-Graduate Program

The major avenue for becoming certified to teach at the elementary, middle, or high school level is an integrated undergraduate-graduate program culminating in a fifth-year, year-long internship. Before the internship, students earn a bachelor's degree outside the field of education. The internship offers 12 graduate credits, which students usually couple with other graduate work leading to a master's degree. A number of UNH master's degree programs may be elected, including two offered by the Department of Education that are specifically designed for preservice teaching. (See Graduate Catalog for description.)

Step 1. Register for Educ 500 (preferably in freshman or sophomore year).

Educ 500, Exploring Teaching, provides an early experience in the schools as a teacher aide and teaching assistant. Students may select this four-credit course at any time; however, most should choose it before completing their sophomore year. Working side by side with experienced teachers, students explore various teaching roles so that they may make realistic decisions about teaching as a career.

Step 2. Apply to the Department of Education for admission to the second phase of the teacher education program and for a co-adviser from that department, who will provide assistance in designing the most appropriate plan of studies. The plan must include a minimum of four credits in each of four areas of study: Educ 700, Educational Structure and Change; Educ 701, Human Development and Learning: Educational Psychology; Educ 703, Alternative Teaching Models; and Educ 705, Alternative Perspectives on the Nature of Education. Since there is no undergraduate major in education, students must complete a major in another department for a baccalaureate degree.

A number of variable-credit modules are available to students in each of the required four course areas, including experiences and workshops in local schools. Certain courses in other departments may be substituted for these requirements. Working closely with advisers, students may develop highly individualized programs, choosing from many alternatives. Since credit in these four areas of study may be taken at either the undergraduate or graduate level, students have greater flexibility for fulfilling the requirements of their college and major departments.

Additional requirements for elementary school teaching include one course in elementary school reading (Educ 706, Introduction to Reading Instruction in the Elementary Schools) and one course in mathematics appropriate for elementary school teaching (recommended—Math 621, Number Systems for Elementary School Teachers; Math 622, Geometry for Elementary School Teachers; Math 623, Topics for Elementary School Teachers; Math 703, Mathematics Education, K-6; Educ 741, Exploring Mathematics with Young Children).

Step 3. Apply for admission to the fifth-year internship and master's degree program.

The final phase of the teacher education program consists of a year-long internship (Educ 800, 801). Students must apply for the fifth-year internship and master's degree program by September 15 of their senior year so that they will have enough time to explore a variety of career and/or graduate study options and conclude their program plans before second semester of that year. Opportunities exist for admitted graduate students to take courses toward their master's degree in the second semester of their senior year.

Before the internship, students will have completed a B.A. or B.S. program with a major outside the field of education. They will have, therefore, a broader general education and greater depth in their area of specialization, as well as opportunities for jobs outside of education. For secondary school certification, students must have completed an approved major program, or its equivalent, in the subject they intend to teach. Candidates for elementary school certification may choose from relevant majors offered at the University.

If accepted into the internship and master's degree program, students have several options from which to choose, including selection of additional courses for further specialization, and selection of workshops and courses offered for credit in intern-site schools. During the internship, students have an opportunity to work with resident supervisors and other interns in various team-teaching arrangements.

Financial Aid A limited number of paid internships are available. Students are hired by participating school districts. Other financial assistance is possible through the Office of Financial Aid.

Criteria for Admission to Fifth Year To be eligible for an internship, students must satisfy the following criteria: 1) favorable rating from school personnel who have worked with them in Exploring Teaching and in any other clinical experience; 2) favorable rating from UNH staff supervising Exploring Teaching and other clinical experience; 3) favorable recommendation from instructors of professional coursework; 4) favorable recommendation from their major program, including approval of the major program as appropriate for secondary school teaching; 5) admission to the UNH Graduate School, which requires an above-average cumulative grade-point average, Graduate Record Examination scores, and appropriate letters of recommendation (minimum grade-point average for accepted students is 2.75; minimum GRE score for accepted students is 900; average grade-point average for accepted students is 3.00; average GRE score for accepted students is 1050 combined); 6) available space in the program.

For further information, contact Paula Dempsey, coordinator of teacher education.

Undergraduate Certification Option

Because of the specialized orientation of majors in mathematics, music education, physical education, preschool education, and vocational/technical and adult education, an undergraduate option for teacher certification in these areas may be elected. This option requires the same education components listed previously, with the election of one semester of student teaching (Educ 694) instead of the year-long internship. Successful completion of Educ 500 and positive recommendation from school-site staff are required for continuation in the program. Final screening takes place before the student-teaching semester. Application for acceptance into student teaching must be filed by February 15 of the junior year.

Academic standards for admission to the option include a minimum 2.50 grade-point average in the major and a minimum 2.20 cumulative grade-point average at the time of application for student teaching.

These programs have limited capacity, and admission to the University or satisfaction of minimum academic standards as stated previously does not guarantee admission to the teacher education programs.

For further information, contact Paula Dempsey, coordinator of teacher education.

General Science Certification

General science certification is an interdisciplinary program that prepares students to teach science in middle and junior high schools. Students may major in the following areas: animal science; biochemistry; biology; botany; chemistry; chemistry and physics teaching; earth science; entomology; environmental conservation; forest resources; plant science; physics; soil science; wildlife management; and zoology. In addition, students must select at least one offering from each of the following basic areas: biology; chemistry; field natural history; physics; and earth science.

For further information, contact Paula Dempsey, coordinator of teacher education.

Interdisciplinary Minors

History and Philosophy of Science

This interdisciplinary minor is designed for students who wish to study the historical and philosophical foundations of the natural and social sciences. It may be combined with any undergraduate major field. General introductions to any of the disciplines are not among the goals; rather, the objective is to acquire skills in historical thinking and critical analysis relevant to the discovery, growth, and application of scientific knowledge.

Further information is available from the College of Liberal Arts Academic Advising Center, Murkland Hall. Any instructor teaching one of the courses may serve as a contact person. A minor consists of any five of the courses listed, with no more than three from any single department.

Hist 521, History of Science (to the Renaissance)
Hist 522, History of Science (post-Renaissance)
Hist 622, History of American Thought
Hist 651, European Intellectual History
Hist 652, European Intellectual History
Hist 789, Seminar in the History of Science
Phil 424, Science, Technology, and Society
Phil 435, The Human Animal
Phil 630, Philosophy of the Natural Sciences
Phil 683, Technology: Philosophical and Ethical Issues
Phil 725, Philosophy of the Social Sciences
Phil 780, Special Topics in Philosophy*
Psyc 571, The Great Psychologists
Psyc 591, Special Topics in Psychology*
Psyc 770, History of Psychology
Psyc 771, Psychology in 20th Century Thought and Society

*with approval

Justice Studies

This interdisciplinary minor includes courses that span the social sciences and humanities, from criminology to philosophy of law, and have as their common subject matter the relationship of law and legal systems to issues of social policy. Students interested in this relationship will be able to plan under the justice studies program a course of study that combines various perspectives and ways of reasoning about problems of justice: jurisprudential, historical, philosophical, and scientific. Students with career interests in law, criminal justice, government, and social services will be able to pursue the intellectual and practical concerns of their potential careers in conjunction with their regular coursework. The justice studies minor may be combined with any undergraduate major field.

Required Courses

1. Core courses: either Polt 507, Politics of Justice or Soc 615, Introduction to Criminology.
2. Just 601, Field Experience
3. Just 797, Special Topics in Justice Studies

Elective Courses

Students will elect two additional courses from a list approved and published on a yearly basis by the Justice Studies Executive Committee. Cooperating departments include history, humanities, leisure management and tourism, philosophy, political science, psychology, social service, sociology, theater and communication, women's studies, health administration and planning, resource economics and community development. (No courses taught solely through DCE shall be admitted as satisfying the justice studies minor requirements.)

Departmental offerings that are currently accepted for the minor include the following:

HAP 630, Ethical Issues in Health Care
Hist 559, History of Great Britain
Huma 650, Humanities and the Law: The Problem of Justice in Western Civilization
Phil 635, Philosophy of Law
Phil 660, Law, Medicine, and Morals
Polt 507, Politics of Crime and Justice
Polt 508, Supreme Court and the Constitution
Polt 513, Civil Rights and Liberties
REco 718, Law of Natural Resources and Environment
Soc 615, Introductory Criminology
Soc 715, Sociology of Crime and Justice
ThCo 637, History and Law of Mass Communication

Students who are interested in minoring in justice studies should consult with the coordinator, Susan White, 213 Horton Social Science Center.

Religious Studies

The religious studies minor offers a scholarly investigation and analysis of various religious phenomena in a multi-disciplinary and cross-cultural manner. Included are such approaches as comparative religion, history of religion, philosophy of religion, psychology of religion, sociology of religion, and religious literature. It entails no sectarian or theological bias. It uses a number of scholarly methods and tools to investigate various religious traditions, as well as such cross-cultural aspects of religion as prayer, belief, mythology, male and female images and roles, ritual, scripture, sectarianism, religious movements, religion and society, and religion and politics.

Students minoring in religious studies must take a survey of world religions (presently provided by Religious Studies 416, Masterpieces of Religious Literature); Religious Studies 501, (Contemporary Approaches to the Study of Religion); Religious Studies 699, Senior Seminar; and the equivalent to two other 4-credit courses—for a total of at least 5 courses, one of which must be at the 600 or 700 level. The two "other" courses may include Religious Studies 599 (Special Topics) and Religious Studies 695, 696 (Independent Studies), or any course accepted for the minor by the Religious Studies Executive Board or approved by petition to the board. Currently, such acceptable courses include the following:

Engl 518, The Bible as Literature
Hist 575, The Ancient Near East
Hist 639, 640 Three Medieval Civilizations
Hist 642, The Age of Reformation
Hist 651, European Intellectual History
Hist 661, 662, England in the Tudor and Stuart Periods
Hist 663, Russia: Origins to Modernization
Hist 683, Religion in World History
Phil 417, Philosophical Reflections on Religion
Phil 520, Introduction to Eastern Philosophy
Phil 571, Medieval Philosophy
Phil 710, Philosophy of Religion
Polt 522, Dissent and the Political Community
Anth 616, Anthropology of Religion
Anth 732, Area Studies in Archaeology: Near East
Soc 797, Special Topics: Q—Religious Movements.
Span 526, Latin American Civilization and Culture

Students wishing to minor in religious studies or who wish more information should consult with the coordinator, Marc Schwarz, 435 Horton Social Science Center.

Women's Studies

The women's studies minor provides students with an interdisciplinary introduction to the status of women in various cultures and historical eras, as well as to the contribution of women to various fields of endeavor. The goal of the minor is to demonstrate the usefulness of gender as a category of analysis. Women's studies courses offer students critical perspectives on such basic questions of the social order as assumptions about gender roles and gender identity.

For the women's studies minor, students must complete 20 credits of women's studies courses. These must include W S 401, Introduction to Women's Studies, and W S 798, Colloquium in Women's Studies, normally taken at the beginning and end of the course sequence, respectively. In between, students should select other women's studies courses or courses from departmental offerings that have been designated women's studies courses or that have the approval of the women's studies coordinator.

Other women's studies courses are W S 595, Special Topics in Women's Studies; W S 795, Independent Study; and W S 796, Advanced Topics in Women's Studies.

Departmental offerings include the following regularly repeated courses:

Admn 780, Issues for Men and Women as Managers
Anth 625, Female, Male, and Society
Econ 658, Women and Work
Educ 410, Women and Education
Educ 7011, Sex Role, Learning, and School Achievement
Engl 585, Introduction to Women in Literature
Engl 586, Introduction to Women Writers
Engl 685, Women's Literary Traditions
Engl 785, Major Women Writers
Hist 565, Women in Modern Europe
Hist 596, Women in American History
Nurs 595, Women's Health
Psyc 551, Psychology of Sex Roles
ThCo 567, Images of Gender in Media
S S 701, Women and Aging

Students may complete the minor requirements by selecting from other courses that are offered as special topics by the departments. In the past, such offerings have included the following: Arts 487, Themes and Images in Art: Major Mythic Images of Women; Polt 701, The Courts and Public Policy; and others.

Students who wish to minor in women's studies should consult with the coordinator, Cathryn Adamsky, 307A Dimond Library, 862-2194.

Bachelor of Arts Programs

The Bachelor of Arts program provides a broad liberal education with a concentration involving a minimum of 32 credits in a major field.

Bachelor of Arts Degree Requirements See page 17 for requirements.

Majors in the Bachelor of Arts Program in the College of Liberal Arts A department may specify certain (but not more than 13) required courses. Students must declare a major before the beginning of the junior year.

The objectives, opportunities, and department requirements of the majors in the Bachelor of Arts program are described in the paragraphs that follow.

Anthropology

(For descriptions of courses, see page 192.)

The anthropology major, offered by the anthropology section of the Department of Sociology and Anthropology, provides an introduction to the various branches of anthropology and an appreciation of its place among other academic disciplines. At the same time, the major is designed to encourage intensive study of particular topics within the field,

according to the interests and talents of students. It is intended to provide both a broad basis for the education of general students and to offer sufficient background for those who may wish to pursue a career in anthropology at the graduate level. In addition, a concentration in social change and development is available for interested students.

Majors must complete a minimum of 32 credits with grades of C− (1.67) or higher and a grade-point average of 2.00 or better, distributed as follows: Anth 411, 412, either 516 or 518, one topical course, one ethnographic-area course, and any other three courses in anthropology or related disciplines approved by the supervisor.

Students wishing to major in anthropology should consult with the chairperson of the Department Committee for Undergraduate Studies in Anthropology.

Departmental Honors Honors in anthropology will be awarded to those students who achieve, in addition to the regular requirements of the major, at least a 3.67 grade-point average in courses counted toward the major and satisfactorily complete a four-credit senior thesis under the guidance of a faculty member. A 3.50 overall average is also required. Students wishing to work for honors should inform the undergraduate committee of their intent during the second semester of their junior year, appending their academic record and a statement of the area in which they intend to write a thesis.

The Arts

(For descriptions of courses, see page 102.)

The courses offered by the Department of the Arts provide an opportunity, within the liberal arts framework, for serious art students to acquire a thorough knowledge of the basic means of visual expression, to acquaint themselves with the history of art, or to prepare themselves for a career in art teaching. In addition, these courses are designed to offer foundation experience for students who are interested in art but are majoring in other departments in the University. The Department of the Arts offers programs leading to a Bachelor of Fine Arts degree (see page 37) and a Bachelor of Arts degree. Certification for art teaching in the public schools is also offered in cooperation with the Department of Education (see Preparing for Teaching, page 23).

The arts major leading to a Bachelor of Arts degree is offered with two options: studio and art history.

Candidates applying for admission to the Bachelor of Fine Arts program and all students wishing to transfer from other schools into the arts major, art studio option, are required to submit a portfolio. Students already matriculated at the University may declare the arts major, art studio option, after having completed two studio courses in the Department of the Arts with an average of C+ or above; one of these must be Arts 432, Drawing I. Students enrolling as freshmen at the University may become arts majors in the studio arts option by either of two methods: (a) by admission through acceptance of a portfolio submitted during the senior year of high school; or (b) by entering the University as an undeclared major and taking two courses in the Department of the Arts with an average of C+ or above; one of these must be Arts 432, Drawing I. There is no portfolio requirement for those entering the art history option of the arts major. The University reserves the right to retain selections from a student's work for a period of not more than two years.

Art Studio Option Students selecting the art studio option must complete a minimum of 11 courses (44 credits), of which the following are required: Arts 432 (Drawing I); one course from the following: Arts 501 (Ceramics I), Arts 513 (Jewelry and Metalsmithing I), Arts 525 (Woodworking), or Arts 567 (Sculpture I); a total of two art history courses at either the 400- or 500-level; two 600-level art history courses; one elected art history course; three elected studio courses; and one 600-level studio course. The foundation courses (400-level courses) should be completed during the first year.

While these courses represent the minimum departmental requirements for the studio option, students may wish to plan a program involving greater depth in one or several of the studio areas.

Art History Option Students selecting the art history option must complete a minimum of 10 courses (40 credits), of which the following are required: Arts 432, (Drawing I); Arts 431, (Visual Studies); two additional 500-level art history courses; Arts 696, (Methods of Art History); and five additional courses in art history above the 500-level, of which at least two must be in the Pre-Renaissance areas, and at least two must be in the areas of the Renaissance and later. Art history majors will receive preferential placement only in the following studio course: Arts 432. Students majoring in art history are strongly advised to take Engl 501, Introduction to Prose Writing, and two foreign languages, one of which should be German.

Art Education Curriculum The program in art education is organized into a five-year, teacher-education sequence.

This curriculum is designed to prepare teachers of art in the public schools. Completion of the B.A. or B.F.A. degree before a fifth-year internship is necessary for teacher certification. The satisfactory completion of the B.A. or B.F.A. curriculum and the fifth-year internship will satisfy the initial certification requirements for teachers of art in the public schools of New Hampshire and in most other states.

Minor in Architectural Studies The minor in architectural studies provides students with an interdisciplinary introduction to the history, theory, and methods of architecture and its symbolism. The program allows students who are interested in this field to receive programmatic recognition for their work. It is designed to assist those who a) are

contemplating enrollment at a school of architecture; b) become particularly interested in architectural history; c) want to supplement their technical majors (e.g., civil engineering) with strong academic minors; or d) plan to pursue careers in preservation, education, community service, and public relations.

The minor in architectural studies consists of 20 credits (ordinarily five courses) distributed in the following way:

Two courses in architectural history chosen from
- Arts 485, Architectural History
- Arts 654, 17th- and 18th-Century American Architecture
- Arts 655, Early Modern Architecture: Revolution to World War I
- Arts 656, Contemporary Architecture: The Buildings of Our Times
- Arts 698, Seminar in Art History

The course in architectural graphics and design
- Arts 455, Introduction to Architecture

A beginning course in drawing
- Arts 432, Drawing I

An elective chosen in consultation with the program coordinator of the architectural studies minor (an additional course in architectural history, a studio course, or some other appropriate elective)

Admission to the minor will be authorized by the program coordinator. Interested students should consult with the coordinator in advance of selecting the minor.

Minor in Art The minor in art consists of five courses chosen from the offerings of the department, two of which must be at the 500 level or above. Students minoring in art preregister for studio courses with departmental majors.

Classics

(For descriptions of courses, see page 196.)

The classics major is offered by the classics section of the Department of Spanish and Classics. The minimum requirements for a major in classics are: 40 credits offered by the classics section, excluding Latin 401-402. Twenty-four of these must be in courses in Greek and Latin. Students will be encouraged to take courses in related fields such as ancient history, classical art, modern languages, and English, and to take part in overseas study programs in Greece and Italy.

The supervisor for majors is John C. Rouman.

Departmental Honors The Honors Program in Classics is designed primarily and specifically for students of superior ability, demonstrated achievement, and high interest in the study of both Greek and Latin. Students may apply for admission to the program during their junior year. Applicants must have completed at least: Latin 504 and Greek 504, either Latin 631 or Greek 631, one 700-level literature course in Latin, and one 700-level literature course in Greek. Applicants must have a minimum grade-point average of 3.67 in their Latin, Greek, and classics courses, as well as a 3.50 overall average. Students meeting these criteria may apply to the program by writing to the supervisor for classics and seeking the approval of the classics faculty. Each student admitted to the honors program receives a faculty adviser who is responsible for arranging the student's subsequent program. The faculty adviser will be appointed to teach "Introduction to Classical Scholarship," either Latin 795I or Greek 795P, depending on the student's classical language of primary interest. The honors student must complete satisfactorily an honors thesis and a final oral examination covering aspects of Greco-Roman studies and classical scholarship. In addition to the course in classical scholarship, the honors student's total program shall include no less than either four 700-level courses in Greek and two 700-level courses in Latin, or four 700-level courses in Latin and two 700-level courses in Greek, depending on which classical language is the object of the student's primary interest and the focus of the student's research course in classical scholarship.

Communication

(For descriptions of courses, see page 200.)

Communication is one of the two majors offered in the Department of Theater and Communication. The communication major emphasizes a broad, integrative approach to various forms of communication including: rhetorical studies, media studies, interpersonal/small group communication, and communication theory. These involve the analysis of the use of symbols to construct personal and social realities, the effects of media, the processes of symbolic interaction, the effects of persuasive messages, theories of interpersonal and small group interaction, the differences in communication patterns across cultures, and the role that information transfer plays in social cohesion and social change.

All communication majors learn about a wide spectrum of human behavior: intrapersonal, interpersonal, group, mediated, and mass. Students are taught critical analysis of verbal, nonverbal, and mediated messages. They explore connection and interrelationships among various types of communication, theoretical perspectives, and methodologies. Coursework relates to the social sciences, the humanities, and to other areas of liberal studies.

Emphasis within the major is on theory and analysis. The application of theories and concepts of communication to a variety of specific communication processes, however, is considered an important part of the communication major. The abilities to understand and analyze communication processes critically have provided communication majors with excellent background for many careers and fields of graduate study.

The communication major consists of 40 credits as follows:

Required: Three introductory courses (12 credits): ThCo 402, 403, 455; and a methods course (4 credits).

Electives: Three 500-level courses (12 credits) selected from a specified list of courses appearing on the Communication Advising Form; and three courses (12 credits) at the 600 level or above also selected from the Communication Advising Form.

Some interdepartmental coursework or reasonable substitution is possible but must be arranged between the student and his or her adviser.

Students interested in a communication major should consult with the coordinator of the communication section of the Department of Theater and Communication concerning requirements for the major. Transfer students wishing to major in communication must receive departmental approval.

English

(For descriptions of courses, see page 131.)

Through studying a wide variety of literary materials, English majors deepen their understanding of history, culture, language, and human behavior. They also gain skill in writing, reading, and critical thinking. Upon graduation, English majors traditionally enter a broad range of vocational fields and areas of graduate study.

The Department of English offers two majors: the English major and the English teaching major. It also offers a journalism program; courses in writing nonfiction, fiction, and poetry; courses in linguistics; and courses in film.

The English Major The English major has two chief objectives: to provide all students with a common core of literary experience and to provide each student with the opportunity of shaping a course of study to suit individual interests. The flexibility and freedom inherent in the second of these objectives places a responsibility upon students to devise a program that has an intelligent rationale. For example, students who intend to pursue graduate study in English literature should choose more than the minimum number of advanced literature courses and should seek a broad, historical background. Students with special interests in linguistics or writing may, on the other hand, wish to elect only the minimum number of advanced literature courses required for the major. All students should secure the assistance and approval of their advisers in formulating an early plan for the major program.

For the English major, students must complete a minimum of 40 credits of major coursework including: Engl 519, two additional 500-level courses, and seven courses numbered 600 and above. In selecting these courses, students must be sure to meet the following distribution requirements:

1. Two courses in literature prior to 1800: either two advanced courses (numbered 600 or above), or one advanced course and Engl 513.

2. Two courses in literature since 1800: either two advanced courses, or one advanced course and one course from the following list: Engl 514, Engl 515, Engl 516.

Students interested in majoring in English should consult the chairperson.

The English Teaching Major This major is designed for students wishing to teach English in middle or high schools. Completion of this undergraduate major does not in itself, however, meet state certification requirements. To meet these requirements, students should enroll in the undergraduate major and, by September 15 of their senior year, apply for the fifth-year teaching internship and master's degree program. (For a full description of requirements for the integrated undergraduate-graduate program for teachers, and its several options, see the section entitled "Preparing for Teaching," page 23.) Undergraduate English teaching majors must pass the following English courses with an average of 2.50 or better: Engl 514, 516, 519, 619, 657, 710, 718 or 791, 792, and two additional literature courses numbered 600 or above. Engl 513 may be substituted for one of these two courses.

Students who are interested in majoring in English teaching should consult the director of the English teaching program.

Writing Programs The English department offers a journalism program that, though not a major, prepares students to become professional journalists upon graduation. The program consists of five sequential writing courses that students should begin no later than the second semester of the sophomore year. Internships at daily newspapers are available. Students interested in this program should inquire at the departmental office.

The English department also offers courses for students interested in becoming writers. Up to four consecutive creative writing workshops can be taken in *fiction* or in *poetry*, as well as a course in form and theory of either genre. The instructors for these courses are professional writers. Interested students should inquire at the departmental office.

French

(For descriptions of courses, see page 142.)

The French Major In addition to its value in the context of the liberal arts, the French major provides knowledge of the language, literature, and culture of France, useful in a number of careers, such as teaching, business, law, and social service. Prospective teachers should consult the section on "Preparing for Teaching," page 23. Students interested in nonteaching careers are urged to consult with members of the French faculty and with other appropriate departments early in their academic careers.

A major consists of 36 credits in courses numbered 631 or above, in which readings are in French. Fren 631, 651, 652, and 790 are required of majors. Majors are encouraged to take courses in the literature of other countries as well as in fields such as music, art, philosophy, history, political science, and sociology that provide insight into nonliterary aspects of culture. A minor in French

consists of 20 credits in French courses numbered 503 and above. Members of the department supervise the work of both majors and minors.

The department offers a junior year abroad at the University of Burgundy in Dijon, France. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, Fren 685-686. Early consultation with the director of the program is urged.

Each year, the French government offers a teaching assistantship in a French secondary school to a graduating French major nominated by the department.

Five-Year, Dual-Degree Program in French and Business Administration The dual-degree program permits students to earn both a B.A. in French and an M.B.A. in five years instead of the normal six. All requirements for both the French major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the departmental adviser to the program in their freshman year.

Geography

(For descriptions of courses, see page 144.)

Geography is best defined as the discipline that describes and analyzes the variable character, from place to place, of the earth as the home of man. As such, geography is an integrating discipline, studying many aspects of the physical and cultural environment that are significant to understanding the character of areas or the spatial organization of the world.

Geography aims to provide its students with a basis for understanding the world in which we live.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography provides an excellent core discipline for a liberal education. Those who would understand geography must also know something of the earth sciences, as well as economics, cultures, politics, and processes of historical development.

Students who have a strong interest in the spatial organization of the world and the distinctive character of its major regions and who also want a broad educational experience can achieve these goals effectively by majoring in geography.

Students with degrees in geography have found their education valuable in such fields as urban and regional planning, locational analysis for industry and marketing organizations, cartography, library work, military intelligence, international studies, the Foreign Service, travel and tourism, and journalism.

Students planning careers as scholars or teachers in the field should concentrate their course work in geography and appropriate related disciplines and should plan to go on to graduate study after completing an undergraduate major in geography. Students from this department have been admitted to first-rate graduate schools in all parts of the United States.

Students who major in geography are required to take Geography 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits. The seven courses should include: Geography 570; 572; any two courses in the group 581, 582, or 583; 797; and two additional intermediate-level courses in geography.

The department also offers an alternative concentration in urban geography. This concentration consists of six courses drawn from the geography major curriculum (401 or 402, 572, 582, 583, 590, and 797) and at least three additional courses from the following list: Hist 624, Polt 703, and C D 508, 614, and 717.

A minor consists of five courses (20 credits) in geography.

Students interested in majoring in geography should consult with the supervisor, William H. Wallace.

German

(For descriptions of courses, see page 145.)

The German major is offered by the Department of German and Russian. This program is designed to be of interest to the following groups of students:

1. Those who have a special interest in the German language, literature, and culture.

2. Those who intend to enter fields in which a background in foreign languages and literatures is desirable. Examples are: international banking, trade, science, library science, government service, and international service organizations.

3. Those who plan to teach German in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level should plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject. Dual majors are also possible.

4. Those who intend to pursue graduate study in German language and literature or foreign language education in preparation for teaching careers at the high school or university level.

The University of New Hampshire is associated with the Institute of European Studies (I.E.S.) centers in Freiburg, West Germany, and Vienna, Austria. The Department of German and Russian recognizes the I.E.S. study programs (including work-study and internships) as well as a separate one-quarter work-study program in Hamburg, West Germany, as its official junior year abroad programs. These programs are open to all qualified students at the University of New Hampshire regardless of major. Financial aid applies to all approved programs. See Germ 685, 686, Study Abroad.

A major consists of a minimum of 36 credits in German language, literature, and culture beyond German 503. German 504, 525, 526, 631, 632 (or their equivalents), and 16 other credits, 12 of which must be taken in Durham on the 600 and 700

levels, are required of all majors. German 521 and 791 do not count for major credit but are recommended as electives.

A minor consists of 20 credits beyond German 503 including German 631 and 632 (or their equivalents). Either 521 or 525 may be included; 791 may not.

Greek

(For descriptions of courses, see page 197.)

The Greek major is offered by the classics section of the Department of Spanish and Classics. The supervisor for majors is John C. Rouman.

The minimum requirements for a major in Greek are: 32 credits in Greek, including Greek 401-402. Students are encouraged to take courses in related fields such as Latin, classics, and ancient history, and to take part in overseas study programs in Greece.

For the Honors Program in Classics, see page 28.

History

(For descriptions of courses, see page 149.)

The history major is designed to provide both an awareness of the past and the tools to evaluate and express one's knowledge. Its requirements expose a student to the breadth of the human past, allow concentration in an area of special interest, and offer training in critical reading and writing.

Students majoring in history must complete 32 credits in history courses with a grade of C− or better and an overall average in these courses of 2.00 or better. History majors must complete History 500, Introduction to Historical Thinking, in the semester following declaration of major. Majors must take History 797, Colloquium in History, during their senior year. In addition to 500 and 797, a major must take at least six courses, of which a minimum of three must be at the 600 level or above. These courses must include a minimum of one semester course each from Groups I, II, and III listed in the Description of Courses. For transfer students, a minimum of four of the semester courses used to fulfill the major requirements must be taken at the University of New Hampshire and at least two of these must be numbered 600 or above.

Students intending further work in history beyond the bachelor's degree are urged to take Hist 775, Historical Methods.

Students intending to major in history should consult with the chairperson of the department. Suggested programs for students with special interests or professional plans are available in the department office.

Five-Year, Dual-Degree Program in History and Business Administration The dual-degree program permits students to earn both a B.A. in history and an M.B.A. in five years instead of the normal six. All requirements for both the history major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the history department adviser early in their sophomore year.

Undergraduate Awards for Majors Each spring the members of the departmental undergraduate committee choose one or more senior majors to receive the *William Greenleaf Prize in History.* Award candidates must have a minimum grade-point average of 3.20 in history courses and must submit a major paper completed for a history course or written specifically for this award. Individuals may nominate themselves or may be nominated by faculty members. Phi Alpha Theta, the history honor society, is open to majors who have a minimum grade-point average of 3.30 in history courses.

Humanities

(For descriptions of courses, see page 153.)

The major in humanities allows students to design and pursue under faculty guidance a coherent interdisciplinary program in the humanities (art, drama, language, literature, music, philosophy). The student defines the subject, selects a program of related courses, and may elect to undertake a senior project of at least four credits on the subject (Huma 699). The subject may be a historical period or any other topic that may be explored through several disciplines in the humanities. The program must have clear educational and intellectual merit and be sponsored by a faculty member from the Humanities Division and approved by the humanities program core faculty.

Students who wish to become humanities majors should submit a formal proposal to the committee by the end of the sophomore year. Normally, students should have a grade-point average of at least 2.70. Students should select most of the courses for the program from those offered for major credit by departments within the Humanities Division, but they are also encouraged to include courses from outside the division (especially from history) that are appropriate to the major subject. The number of courses in the program may vary, but at least 32 credits of major coursework must be completed.

Before submitting formal proposals, interested students are urged to seek the advice of a humanities core faculty member. Inquiries about the humanities major should be directed to Warren R. Brown, coordinator of the humanities major program, 19 Murkland.

Latin

(For descriptions of courses, see page 197.)

The Latin major is offered by the classics section of the Department of Spanish and Classics. The supervisor for majors is John C. Rouman.

The minimum requirements for a major in Latin are: 32 credits in Latin, excluding Latn 401-402. Students are encouraged to take courses in related fields such as Greek, classics, and ancient history,

and to take part in overseas study programs in Italy.

For the Honors Program in Classics see page 28.

Linguistics

(For descriptions of courses, see page 156.)

Linguistics is the study of one of the most important characteristics of human beings: language; it cuts across the boundaries between the sciences and the humanities. The program is an excellent liberal arts major or preprofessional major for law, medicine, clergy, and others. Dual majors with a foreign language, business administration, and the like, are quite feasible.

Students interested in the major or the minor should consult with the program coordinator, or with any professor who teaches linguistics courses. To declare a major in linguistics, a student must first submit a proposal, signed by a faculty sponsor, to the Linguistics Committee. Information is available from the Advising Center, Murkland Hall.

A minor in linguistics is also available and consists of any five linguistics courses approved by the linguistics coordinator.

Requirements for the Major

1. Ling 505, Introduction to Linguistics
2. Ling 506, Introduction to Comparative and Historical Linguistics; or Engl 752, History of the English Language
3. Ling 793, Phonetics and Phonology
4. Ling 794, Syntax and Semantic Theory
5. Two years college study (or equivalent) of one foreign language
6. One year study (or equivalent) of a second foreign language from a different language family or subfamily (Old English may count as the second foreign language if the first foreign language is not in the Germanic family); *or*

   Psychology 712, Psychology of Language (and its prerequisites); *or*

   Philosophy 745, Philosophy of Language (and its prerequisites)
7. Four elective courses from the list below.

Area Courses

Anthropology: 795-796, Anthropological Linguistics.

Classics: 595-596 section H, Sanskrit; section I, Hittite (by arrangement).

Communication Disorders: 524, Applied Phonetics of American English; 522, The Acquisition of Language.

Computer Sciences: 762, Introduction to Natural Language Processing.

English: 715, Applied Linguistics: Teaching English as a Second Language; 716, Problems in Applied Linguistics; 718, English Linguistics and Literature; 752, History of the English Language; 778, Brain and Language; 779, Linguistic Field Methods; 790, Special Topics in Linguistic Theory; 791, English Grammar; 793, Phonetics and Phonology; 794, Syntax and Semantic Theory.

French, German, Greek, Latin, Russian, Spanish: 791, Methodology of Foreign Language Teaching.

German: 733, History and Development of the German Language.

Latin: 795, 796, Special Studies in Latin.

Linguistics: 505, Introduction to Linguistics; 506, Introduction to Comparative and Historical Linguistics; 790, Special Topics in Linguistic Theory; 793, Phonetics and Phonology; 794, Syntax and Semantic Theory; 795, 796, Independent Study.

Philosophy: 550, Logic; 618, Recent Anglo-American Philosophy; 650, Logic: Scope and Limits; 745, Philosophy of Language.

Psychology: 511, Introduction to Perception, Language, and Thought; 712, Psychology of Language.

Russian: 734, History and Development of the Language.

Sociology: 797F, Socio-Linguistics.

Spanish: 601, Spanish Phonetics; 733, History of the Spanish Language.

Theater and Communication: 572, Language and Behavior; 630, Psychology of Communication; 783, Theories of Language.

Other courses may be substituted, with the permission of students' advisers and the Linguistics Committee, when they are pertinent to the needs of the students' programs.

Microbiology

(For descriptions of courses, see page 162.)

Microbiology explores the fundamental nature of living organisms that cannot be seen by the unaided eye. The primary emphasis is on bacteria and viruses. Such learning is especially valuable to students planning to enter city, state, or federal government service, or positions with universities, research institutes, or industrial organizations. Some students go on for graduate work. The principal areas of concentration in the department are: 1) general; 2) medical; 3) environmental; 4) marine; 5) microbial cytology and ultrastructure; 6) virology; and 7) genetic engineering and biotechnology.

A minimum of 28 semester credits from department offerings must be completed in addition to a course in biochemistry (Bchm 656). Chem 403-404 should be taken in the freshman year, and Organic Chemistry (Chem 545 or 651-652) in the sophomore year. Within the Department of Microbiology, the following core courses are required: General Microbiology (503), and Taxonomy and Ecology (701). For students desiring a strong background in medical microbiology, Pathogenic Microbiology (602), Immunology (705), and Virology (706) are recommended. For students wishing to emphasize natural processes, the following courses are recommended: Marine Microbiology (707), Microbial Biogeochemistry (708), and Host-Microbe Interactions (712). Environmental Microbiology (600), Microbial Genetics (704), Microbial Cytology and Electron Microscopy (710) are recommended as courses valuable to microbiology majors. The Problems in Microbiology course (795-796) is available for students by special permission. For students considering graduate school

and the microbiology registry exam, courses in mathematics through calculus, physics, quantitative analysis, and introductory courses in botany and zoology are strongly recommended. The courses for each major program are selected to meet the needs of the individual, as determined by the student and the adviser.

Students interested in majoring in microbiology are advised to consult Thomas G. Pistole.

Music

(For descriptions of courses, see page 163.)

The Department of Music offers two degree programs: the Bachelor of Arts and the Bachelor of Music. The Bachelor of Music degree is discussed on page 38.

The Bachelor of Arts program offers students an opportunity to major in music within the liberal arts curriculum. This program is intended for those who wish to pursue the serious study of music and to acquire at the same time a broad general education; it is recommended for those considering graduate study leading to the M.A. or Ph.D. degrees, or the five-year undergraduate-graduate program in teacher education.

To be admitted formally to the B.A. program, students must give evidence of satisfactory musical training by taking an admission audition. Students must declare music as a major before the beginning of the junior year, but it is highly recommended that they declare as early as possible, considering the large number of required courses. Admission to the upper level of the degree program will be subject to review by the Department of Music faculty.

The Bachelor of Arts degree is offered with four options: music history, performance study, music theory, and preteaching. All students must complete a minimum of 32 credits of coursework in music, of which the following are required: Musi 471-472, 473-474, 501-502, 571-572, 573-574, and one course from 771, 781, or 782. In addition, the requirements for each option are given below.

Music History Option Advanced theory (4 credits); advanced history and literature (12 credits); any one of 541–550 inclusive (8 credits). Students must also demonstrate the ability to sight-read a Bach chorale harmonization.

Music Theory Option Advanced theory (12 credits); advanced history (4 credits); any one of 541–550 inclusive (8 credits). Students must also demonstrate the ability to sight-read a Bach chorale harmonization. The emphasis in this option is on musical composition and/or theory.

Performance Study Option Advanced theory or literature (4 credits); performance study (16 credits—two credits per semester). Qualified students may major in voice, piano, strings, woodwinds, brass, or percussion. Voice majors must successfully complete, in addition to the foreign language requirement, one of the following course sequences: Ital 401-402, Germ 401-402, Fren 401-402.

Music Preteaching Option MuEd 500; Musi 751-752; Musi 779; techniques and methods (8 credits); 8 credits from Musi 441–453 inclusive; 8 credits from any one of Musi 541–550; piano proficiency. (See page 23, Preparing for Teaching).

A public performance is given during the senior year. For music history majors this must be a lecture or lecture-recital; for performance majors, a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition; for preteaching majors, a half recital is the minimum. A more detailed description is available from the Department of Music.

All students minoring in music must complete a minimum of 20 credits of coursework in music, of which the following are required: Musi 471-472, Musi 473-474, Musi 501-502. Music 411-412 may be substituted for Musi 471-472 and Musi 473-474.

The Department of Music is a member of the National Association of Schools of Music. Prospective B.A. majors in music are advised to consult with Paul Verrette.

Philosophy

(For descriptions of courses, see page 173.)

Philosophy has always been the heart of liberal education, deepening and enriching the lives of those who pursue it. It is also excellent preparation for a variety of vocational and professional endeavors.

The Philosophy Major The following courses constitute a core required of all majors: 530, 570, 572, 573, 618, 620, 701, and 702. Beyond the core, majors must select one additional philosophy course at any level (exclusive of 495-496, 699, and 795-796) for a minimum of nine courses. Courses used toward fulfilling requirements for the major may not be used to satisfy General Education Requirements. (This restriction does not apply to dual majors.)

Special-Interest Program Students may add to the above major a special-interest program of value in planning for postgraduate education or entry into such areas as law, medicine, business, education, theology, or social work. Special advisers are prepared to provide informal counsel to philosophy majors interested in these areas.

Graduate Preparatory Emphasis This emphasis is strongly recommended for students who plan to do graduate work in philosophy. Beyond the eight core courses, such students should select, with their advisers' approval, four additional philosophy courses above the 400 level, for a total of twelve courses. At least three of these four should be on the 600–700 level (exclusive of 699 and 795-796) and one of them should be 550.

Departmental Commendation Students accepted for departmental commendation will register for 699 (usually during the second semester of the senior year) and will write, under the guidance of an

adviser, an original paper in philosophy. If completed successfully, students will receive a letter of commendation.

Students interested in an honors program in philosophy must first meet the eligibility standards set by the College of Liberal Arts and should then contact the department chairperson for information.

Philosophy Minor Any five philosophy courses constitute a minor.

Five-Year, Dual-Degree Program in Philosophy and Business Administration The dual-degree program permits students to earn both a B.A. in philosophy and an M.B.A. in five years instead of the normal six. All requirements for both the philosophy major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult the departmental adviser to the program early in their sophomore year.

Political Science

(For descriptions of courses, see page 182.)

The study of politics, to which the courses and seminars of the Department of Political Science are devoted, includes the development of knowledge of political behavior by individuals and groups as well as knowledge about governments: their nature and functions, their problems and behavior, and their interactions—at the national and international levels and at the local, state, and regional levels.

Much of the learning offered by the Department of Political Science can also be regarded as essential for good citizenship, since political knowledge helps to explain both the formal institutions by which societies are governed and the issues that encourage people toward political interest and political action. In addition, such learning is especially valuable to students planning to enter local or national government or other public service, including foreign service, and it will be of great help to those who intend to study law and enter the legal profession. For teaching, particularly at the college level, and for many types of government service, graduate work may be indispensable, and an undergraduate major in political science will provide the most helpful foundation for further study in the field. Such an emphasis will also be valuable for students seeking careers in journalism, international organizations, and the public affairs and administrative aspects of labor, financial, and business organizations.

The major program in political science consists of at least nine courses (36 credits) and not more than 12 courses (48 credits) to be distributed in the following way:

1. Two from the offerings at the 400 level. These courses are designed for the introductory level and should be completed by majors by the end of the sophomore year.
2. Six from the offerings at the 500 and 600 levels. Of these, at least one shall be chosen from each of the four fields in which the department's courses are organized: American politics, comparative politics, international politics, and political thought.
3. One from the offerings at the 700 level.

Internships and Advanced Study In addition to the courses regularly offered, the department will have available selected topics, advanced study in political science, and internships. Interested students should check with the department office to learn of the offerings for a given semester.

The department also offers several internship opportunities giving students experience in various aspects of government, policymaking, and the legal system at the local, state, and national levels. Students need not be political science majors, but a student must have taken certain course prerequisites for each kind of internship. In addition, students must have junior or senior standing and normally have a 3.00 average or higher to be eligible for consideration. Washington placements are made either through the Department of Political Science or through the Washington Center for Learning Alternatives; major credit must be arranged through the department.

Departmental Honors Honors in political science will be awarded to those students who achieve at least a 3.67 average in political science courses and complete satisfactorily an honors thesis. Honor students must also achieve a 3.50 overall average. Students wishing to pursue departmental honors should apply for admission to the honors program during their junior year. Applicants must have completed at least two 400-level courses, five of six 500- or 600-level courses, two of which must be in the student's primary area of interest, and one 700-level course, in the primary interest area. Students meeting these and the grade-point average criteria may apply to the honors program by identifying a potential faculty sponsor who writes a letter of support to the department's Undergraduate Program Committee. Honors students enroll in Political Science 799 and must complete all other major requirements. A major component of the honors program will be the honors thesis.

Psychology

(For descriptions of courses, see page 185.)

The Department of Psychology offers an academic major that aims to provide students with a broad education, while also allowing some specialization. The program exposes students to the scientific study of behavior and encourages an increased understanding of the behavior of humans and animals.

Students majoring in psychology must complete 36 credits, distributed as follows:

1. Psyc 401, 402, and 502
2. Two 500-level courses other than Psyc 502.

Of these, one must be from group (a) below and one from group (b):
a) Psyc 511, 521, 522, 531
b) Psyc 512, 552, 553, 571, 581, 582
3. Three courses (12 credits) from the 700-level departmental offerings. A maximum of 4 credits of externship (Psyc 793 and 794) and independent study (Psyc 795) may be counted.
4. One additional course from courses approved for major credit.

Transfer students who elect to major in psychology must complete at least 18 credits in the program at UNH to qualify for the degree in the psychology. The distribution of these credits will be determined by the department's academic counselor.

Specific course selections should be discussed with advisers. Exceptions to the requirements for the major require a petition to the department.

Psychology majors planning to go on to graduate study in psychology should include Psyc 703 or 704 among their courses.

The minor in psychology consists of five courses (20 credits), including Psyc 401 and at least two courses at the 500 level or above.

See the department's secretary for further details on the major or minor in psychology.

Advising System Undergraduate advising in the department is conducted jointly by the department's academic counselor and the full-time faculty. The academic counselor has primary responsibility for advising freshman and sophomore psychology majors and is the initial contact for all majors in a state of transition (readmitted, transfer, newly declared students, etc.). The academic counselor assists students in all phases of educational planning and decision making, including preregistration, long-range academic planning, degree and program requirements, and career selection and planning. Junior and senior psychology majors are officially assigned to a faculty adviser with appropriate consideration for student preferences. The advising relationship with a faculty member is designed to encourage refining career and educational decisions.

Five-Year, Dual-Degree Program in Psychology and Business Administration The dual-degree program permits students to earn both a B.A. in psychology and an M.B.A. in five years instead of the normal six. All requirements for both the psychology major and the M.B.A. program offered by the Whittemore School of Business and Economics will be met. A maximum of 16 credits may be counted toward both degrees. Students interested in this program should consult with the departmental adviser to the program early in their sophomore year.

Undergraduate Awards for Majors Each spring the faculty choose two psychology undergraduates as the recipients of the following awards: the Herbert A. Carroll Award for an outstanding senior in psychology, and the George M. Haslerud Award for an outstanding junior in psychology.

Russian

(For descriptions of courses, see page 146.)

The Russian major is offered through the Department of German and Russian. It provides students with an opportunity to study one of the world's most important languages, its culture, and its literature. In addition to the intrinsic value of Russian as a liberal arts experience, the Russian major leads to a number of careers, such as teaching, translation and interpreting, government, and foreign service. It is also a valuable asset in preparing for careers in law, business, economics, and international trade, and it can serve as a dual major with business administration, international affairs, the natural and physical sciences, and other liberal arts fields such as English, history, political science, sociology, philosophy, theater and communication, linguistics, and other foreign languages.

The Russian major consists of a minimum of 36 credits above Russ 504. Specific course requirements are Russ 505-506, Russ 521, Russ 425 or 525, Russ 631-632, Russ 691, and Russ 733, plus an additional 4 credits from among other offerings in Russian.

The minor in Russian consists of a minimum of 20 credits above Russian 402 and must include Russ 503-504 and a minimum of one course on the 600 level.

The Russian section of the department offers for credit an annual summer five-week or ten-week language seminar in the USSR.

Students wishing to major in Russian should contact Aleksandra Fleszar in Murkland Hall 16.

Social Work

(For descriptions of courses, see page 191.)

The social work major prepares graduates for professional social work practice within the context of a liberal arts education. It also prepares students for admission to graduate schools of social work and other graduate professional programs in human service professions.

Social work majors pursue a program that deals with the origin, development, and organization of health and welfare institutions; methods of social work practice; and the relationship of the social work profession to contemporary social issues and problems. Social work majors gain direct experience and a better understanding of the field by required participation in a social welfare setting. The details of the field experience will be arranged between the student and the field work coordinator.

Social work majors are required to take Biol 401, S S 524, 525, 550, 551, 622, 623, 640, 641, and Soc 601. Students wishing to major in social work should consult with the chairperson, Betty Holroyd Roberts, in Murkland Hall.

Sociology

(For descriptions of courses, see page 194.)

The major in sociology is designed to provide a degree of concentration in the study of society consonant with a broad liberal education. However,

those who wish to teach sociology in secondary schools are advised to consult with the chairperson of the Department of Education for additional courses in related subjects and teaching that may be required. Those who wish to pursue a career in social service should consult with the chairperson of that department about additional courses or possibilities for graduate training. Those who wish to enter graduate programs in sociology should consult with their advisers about additional courses, particularly in the areas of theory, statistics, and methodology, that they should take.

Majors must complete a minimum of 36 semester credits with grades of C− or higher in each of these courses and a grade-point average of 2.00 or better in sociology courses (Anth 625 may be taken and counted as a sociology course). Soc 400 (or 500 or 600), 502, 599, 601, and 611 or 612 are required. At least two of the additional major courses must be at the 600 or 700 level (not including 795 or 796). The department recommends that majors select one of three concentrations:

1. General sociology, involving the five core requirements plus additional courses in sociological theory and methods. This concentration is particularly recommended for students who plan to do graduate study in sociology.
2. Social psychology, involving the five core requirements plus additional courses in social psychology.
3. Applied sociology, involving the five core requirements plus additional courses for students interested in applying sociology to such fields as criminal justice, mental health and illness, race relations, the family, and sociological impact assessment.

Students interested in majoring in sociology should consult with the chairperson of the Departmental Committee for Undergraduate Studies in Sociology for guidance in selecting a concentration. It is the responsibility of all sociology majors to obtain the latest information from the department office.

A minor consists of five 4-credit courses in sociology with a C− or better in each course.

Departmental Honors Honors in Sociology will be awarded to students who achieve, in addition to the regular requirements of the major, at least a 3.67 grade-point average in courses counted toward the major and satisfactorily complete a four-credit senior thesis under the guidance of two faculty members. A 3.50 overall grade-point average is also required. Students wishing to work for honors should inform the undergraduate committee of their intention during the second semester of their junior year, appending their academic record and a statement of the area in which they intend to write their theses.

Spanish

(For descriptions of courses, see page 198.)

The major in Spanish, offered through the Spanish section of the Department of Spanish and Classics, is for those students who wish to acquaint themselves more thoroughly with the language, culture, and literature of the Spanish-speaking peoples.

In addition, through the major, students can prepare for practical goals: teaching Spanish in grade or high schools or teaching other subjects in bilingual programs. With advanced degrees, teaching at the college level and engaging in scholarly research or entering such fields as linguistics or library science are career opportunities. Majors gifted in languages may consider the fields of translation and interpretation. With coursework in business, sociology, psychology, speech, etc., Spanish majors may prepare for work in Spanish-speaking areas of the world as well as in bilingual regions of the United States and also with many governmental agencies.

The Spanish section sponsors a Junior Year Abroad program in Spain. It is open to majors and nonmajors. Contact the Spanish section for further details.

The major consists of a minimum of 40 credits. Specific course requirements are 1) language and culture: 525 or 526, 601, 631-632; 2) introductory literature: 650; and either the sequence 651-652 or 653-654, 3) three courses at the 700 level.

Interested students should talk to the assistant chairperson for Spanish or an adviser in the department.

Theater

(For descriptions of courses, see page 202.)

The theater major emphasizes the strengths of general theater training within a broad liberal arts context, with opportunity for specialization and individual development. Students interested in performance, technical, and historical aspects will find opportunities for personal and preprofessional growth in theater, its drama, and the dance in its various forms. The program affords means for independent study and application of basic theories in special projects and for active personal involvement in lecture and laboratory classes. Students are encouraged to participate in all phases of University Theater productions. Theater is a broad-based major, allowing its undergraduates to integrate specific training with other academic disciplines.

The required curriculum for theater majors consists of: a basic course in communication (ThCo 402 or its equivalent); Introduction to Theater (435); two full courses from each of three areas (history/theory, technical, performance) including History of Theater I (436), History of Theater II (438), Stagecraft (459), Voice and Diction I (549), and Acting I (551); plus two upper-level courses in an area of choice. In addition, majors must complete two two-credit project courses: Senior Seminar (697) and Senior Project (698). Individual programs may be planned through consultation with specific advisers.

In addition to general liberal arts preparation, three specific course sequences are available within the theater major: 1) courses leading to a theater major with a concentration in dance (ballet, modern, and theater dance); 2) courses leading to a

major that when combined with requirements of the Department of Education qualify students for secondary school certification; 3) courses leading to a major that when combined with requirements of the Department of Education prepare students for elementary school certification with an undergraduate specialization in youth drama.

All students interested in majoring in theater should consult with the chairperson of the Department of Theater and Communication. Students wishing to transfer to the University of New Hampshire to major in theater must first have the approval of the theater section.

Zoology

(For descriptions of courses, see page 206.)

The Zoology Major The zoology major is designed to provide students with a strong background in the biology of animals, from protozoa to humans, and in areas from cell biology to ecology. Students receive instruction in a core of fundamental courses required for many types of advanced training including medical or graduate schools and teacher training. Ample time is available for electives in specialized disciplines such as marine biology, limnology, ecology, physiology, cell and developmental biology, and neurobiology. Active research programs maintained by the faculty provide undergraduates with opportunities to participate in research projects and to gain special preparation for careers in research.

The University's access to the coastal zone and the lakes region of New Hampshire, combined with the presence of two marine laboratories, one estuarine laboratory, and one freshwater laboratory provides an unusual opportunity for the study of the biology of marine and freshwater organisms.

Zoology majors must complete 32 credits from courses in the biological sciences approved by the department with a 2.00 average and at least a C– (1.67) in each course. Minimum requirements for the zoology major are as follows: Chem 403-404; organic chemistry; calculus (Math 425) or statistics; physics; Zool 412; Bot 412; Biol 541; Zool 518 or 528; Zool 519, 604, 629, or 728; plus an elective. A suggested sequence of courses follows:

Freshman: Zool 412, Bot 412, Chem 403-404, and Math 425 (or REco 528).

Sophomore: Zool 518 or 528, Zool 519, Biol 541, Chem 545.

Junior: Zool 604, Phys 401 (and REco 701 if taken in addition to or instead of Math 425).

Senior: Zool 629 or 728, another biological sciences course in zoology or other biological sciences department (may be taken earlier than the senior year).

Students who are interested in a zoology major should consult the supervisor, Edward N. Francq.

General Science Certification Students majoring in zoology may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Bachelor of Fine Arts Curriculum

(For descriptions of courses, see page 102.)

The Bachelor of Fine Arts curriculum provides training for students who plan to enter professional graduate school or pursue careers as professional artists. The basic unit of nine courses consists of drawing (Arts 432, 532), beginning oil painting (Arts 542), sculpture (Arts 567), sophomore seminar (Arts 598), and four courses in art history. This unit is designed to provide a common body of concepts and techniques and is intended to raise the level of creative achievement for all students in the B.F.A. degree curriculum.

During the junior and senior years, students will concentrate on six courses, two of which must be at the 600 level, in one of the major program areas of the department. The programs are: 1) painting; 2) sculpture; 3) individualized programs. Individualized programs may be designed in the following subject areas: A) ceramics; B) drawing; C) weaving; D) graphics; E) metalsmithing; F) photography; and G) wood furniture design. Proposals for individualized programs are accepted only by permission of the department chairperson, the major adviser, and the Departmental Bachelor of Fine Arts Faculty Committee. Advanced students will also be required to take three art electives. Finally, each senior will be required to take Arts 798, Seminar/Senior Thesis, which culminates in the mounting of an exhibition of the student's work. (Printed copies of suggested sequences of courses may be obtained from the Department of the Arts. Also, see the following listing.)

The four courses in art history required in this program are used as University electives.

Candidates applying for the Bachelor of Fine Arts program are required to submit a portfolio.

Suggested Sequences of Courses B.F.A.—Painting

Freshman Year	Fall	Spring
Arts 432, Drawing I	4	—
Arts 573, Art of the Modern World	4	—
Non-Art Academic	8	8
Arts 532, Drawing II	—	4
Arts 546, Oil Painting I, or Arts 544, Water Media I	—	4
Sophomore Year		
Arts 567, Sculpture I	4	—
Arts 533, Drawing III	4	—
Art History Elective	4	—
Non-Art Academic	4	4
Arts 547, Oil Painting II	—	4
Arts 598, Sophomore Seminar	—	4
Art History Elective (600 or above)	—	4
Junior Year		
Arts 646, Oil Painting III or Arts 645, Water Media II	4	—
Art Elective	4	—
Non-Art Academic	8	4
Arts 647, Oil Painting IV	—	4
Arts 796, Independent Study—Painting	—	8

Senior Year

Arts 798, Seminar/Senior Thesis	8	—
Arts 746, Painting V	4	—
Non-Art Academic	4	8
Art Elective	—	4
Art History Elective (600 or above)	—	4

B.F.A.—Sculpture

Freshman Year

Arts 432, Drawing I	4	—
Arts 573, Art of the Modern World	4	—
Non-Art Academic	8	8
Arts 532, Drawing II	—	4
Arts 567, Sculpture I	—	4

Sophomore Year

Arts 568, Sculpture II	4	—
Art History Elective	4	—
Arts 546, Oil Painting I, or Arts 544, Water Media I	4	—
Non-Art Academic	4	8
Arts 667, Sculpture III	—	4
Arts 598, Sophomore Seminar	—	4

Junior Year

Arts 668, Sculpture IV	4	—
Art History Elective	4	—
Non-Art Academic	4	4
Arts 796, Independent Study—Sculpture	—	8
Arts 767, Casting	—	4

Senior Year

Arts 798, Seminar/Senior Thesis	8	—
Art Elective	4	4
Non-Art Academic	4	8
Art History Elective (600 or above)	—	4

Bachelor of Music Curriculum

(For descriptions of courses, see page 163.)

The Bachelor of Music degree program is offered to students who wish to develop their talent in performance, composition, or music education to a high professional level. The program is recommended to those considering graduate study leading to the Master of Music or Doctor of Musical Arts degrees. Prospective majors are advised to consult with Paul Verrette.

To be admitted to the B.M. program, students must demonstrate a high degree of musical competence or significant creative ability during an audition or examination. Selectivity is exercised as appropriate to the professional requirements of each programmatic option. Students must formally declare the B.M. as a degree program before the beginning of the sophomore year. Continuation into the upper level of the program is subject to review by the faculty of the Department of Music.

A public performance is required during the senior year. (For performance majors this must be a full recital; for theory majors, a lecture, lecture-recital, or a recital including at least one original composition; for music history majors, a lecture or a lecture-recital; for music education majors, a half recital is a minimum.) A more detailed description is available from the Department of Music.

The Bachelor of Music curriculum offers concentration in the following areas: option 1, piano; option 2, organ; option 3, voice; option 4, strings, woodwinds, brass, or percussion; option 5, theory (composition); option 6, music education.

Requirements for the degree include: 128 semester credits; a minimum 2.00 grade-point average in all courses completed at the University of New Hampshire; General Education Requirements; and specific curriculum requirements as indicated. Courses are generally to be completed in their arranged sequence.

Students in music education must maintain a minimum 2.50 grade-point average in the major and have a 2.20 cumulative average at the time of application for student teaching (February 15 of junior year).

See page 15 for an explanation of the new General Education Requirements.

Freshman Year

All Options: General Education Requirements; Musi 471-472, 473-474.

Option 1. Musi 542 (8 credits).

Option 2. Musi 544 (8 credits).

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); Music Laboratory—Choral (2 credits).

Option 4. Performance Study—major instrument (8 credits); Musi 542 (2 credits); Music Lab—instrumental (2 credits).

Option 5. Musi 542 (2 credits); Performance Study—brass (1 credit); Performance Study—woodwind (1 credit), or Techniques and Methods.

Option 6. Performance Study—major instrument (2 credits); Music Laboratory (2 credits); Techniques and Methods (4 credits); MuEd 500; Educ 500.

Sophomore Year

All Options: General Education Requirements; Musi 571-572, 573-574.

Option 1. Musi 542 (8 credits).

Option 2. Musi 544 (8 credits).

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); Music Laboratory—choral (2 credits).

Option 4. Performance Study—major instrument (8 credits); Musi 542 (2 credits); Music Lab—instrumental, (2 credits).

Option 5. Musi 542 (2 credits); Musi 501-502; Performance Study—strings (1 credit), or Techniques and Methods.

Option 6. Performance Study—major instrument (2 credits); Musi 501-502; Music Laboratory (2 credits); Techniques and Methods (4 credits).

Junior Year

Options 1-5: General Education Requirements.

Option 1. Musi 542 (8 credits); Musi 501-502; Musi 771-772; Musi 455.

Option 2. Musi 544 (8 credits); Musi 501-502; Musi 771-772; MuEd 540 and 741.

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); Musi 501-502; a second foreign language—German, French, or Italian (8 credits); Music Laboratory—choral and/or opera workshop (4 credits).

Option 4. Performance Study—major instrument (8 credits); Musi 501-502; Musi 751-752; Ensemble (2 credits); Music Laboratory—instrumental (2 credits).

Option 5. Musi 771-772; Musi 775-776; Musi 779; Musi 781, 782; Musi 542 (2 credits).

Option 6. Musi 751-752; Musi 779; Performance Study—major instrument (2 credits); Music Laboratory (2 credits); Educ 700; Educ 701; and one social science.

Senior Year

Options 3, 4, and 6: one course from 771, 781, 782.

Option 1. Musi 542 (8 credits); Musi 455; Musi 735; two 4-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.

Option 2. Musi 544 (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.

Option 3. Musi 541 (8 credits); Musi 542 (2 credits); two 4-credit courses in music literature and/or advanced theory; Music Laboratory—choral, ensemble, and/or opera workshop (4 credits).

Option 4. Performance Study—major instrument, (8 credits); two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music; Music Laboratory—instrumental (2 credits); ensemble (2 credits).

Option 5. Musi 773; Musi 777 (6 credits); Musi 542 (2 credits); two 4-credit courses in music literature; two 4-credit courses elected outside the Department of Music.

Option 6. MuEd 787-788; MuEd 791-792; Educ 705; Educ 694; Performance Study—major instrument (2 credits); Music Laboratory (1 credit); General Education Requirement.

All students are responsible for adding electives as needed to total a minimum of 128 credits for graduation.

Bachelor of Science Curriculum in Biology

(For description of courses, see page 106.)

The bachelor of science curriculum in biology is an interdepartmental program that permits students considerable specialization while providing them with a broad cultural education.

Degree Requirements

1. At least 128 credits with a minimum cumulative grade-point average of 2.00 in all courses completed at the University of New Hampshire.

2. Completion of the University General Education Requirements, including Engl 401.

Major Requirements

Specific curriculum requirements are presented in detail on page 82.

College of Life Sciences and Agriculture

Thomas P. Fairchild, Dean
Robert O. Blanchard, Associate Dean
Emery P. Booska, Business Manager

Departments

Animal and Nutritional Sciences
Biochemistry
Botany and Plant Pathology
Entomology
Family and Consumer Studies
Forest Resources
Plant Science
Resource Economics and Community Development
Vocational/Technical and Adult Education

Programs of Study

Bachelor of Arts
Botany and Plant Pathology
Entomology

Bachelor of Science
Animal Sciences
- Animal Production and Agribusiness
- Bioscience and Technology
- Preveterinary Medicine

Biochemistry
Biology
Botany and Plant Pathology
Community Development
Entomology
Environmental Conservation
Family and Consumer Studies
- Child and Family Studies
- Consumer Studies

General Studies
Nutritional Sciences
Plant Science
- Industry
- Science

Resource Economics
Soil Science
Vocational/Technical and Adult Education
Wildlife Management

Bachelor of Science in Forestry
Forest Resources
- Forest Management
- Forest Science

Purposes and Programs

The objectives of the College of Life Sciences and Agriculture are to give students a fundamental education in the biological, physical, and social sciences and to introduce them to the arts and humanities. In addition, specific technical courses are provided in students' interests and majors.

The college offers three undergraduate degrees: the bachelor of arts, the bachelor of science, and the bachelor of science in forestry.

Advisory System

A member of the faculty whose area of interest is closely related to the student's is appointed as an adviser to assist the undergraduate in planning his or her academic program.

Undeclared Major

Students may select a major upon entering the college or may wait until registration for the sophomore year. Students who are uncertain about choosing a specific major may remain undeclared during their freshman year. In most cases they should take the following courses, after which they should be ready to declare a major:

Fall	Spring
Chem 403	Chem 404
Bot 412 or Zool 412	Bot 412 or Zool 412
Group 1 or 2 General Education Requirement	Group 1 or 2 General Education Requirement
An introductory course in any department in the College	REco 411*

*or other elective course to meet a General Education Requirement.

Undeclared freshmen should explore possible majors by taking courses in the areas or programs that interest them most. They should talk to faculty, students, and their adviser concerning requirements, job opportunities, etc., in the various programs and should be prepared to declare a major when they preregister for the first semester of the sophomore year.

Combined Programs of Study

In addition to pursuing a single major, students may combine programs of study as follows:
Minors: See page 18 for requirements. See also Interdisciplinary Minors, page 21.
Second Majors: See page 18.
Dual-Degree Programs: See page 17 for requirements.
Student-Designed Majors: See page 82.
Other combined and interdisciplinary opportunities are described in "Special University Programs," pages 81–86.

Interdisciplinary Minor in Plant Pest Management

The interdisciplinary minor in plant pest management provides a broad but comprehensive foundation in the concepts and practices employed in managing the major groups of pests that affect agricultural crops. It covers integrated pest management systems used both in modern agriculture in developed countries and the agricultural practices used in developing countries. It is designed for students majoring in plant science, botany and plant pathology, or entomology with career interests in commercial agriculture, agricultural industries, agricultural consulting, USDA regulatory service, economic entomology, plant pathology, integrated pest management, or Extension. It also provides a strong background for students interested in pursuing advanced degrees required for these areas.

Further information may be obtained from the chairperson of each participating department or any instructor teaching one of the courses. The minor consists of five courses as outlined below:

Select one:	
Bot 651	Plant Pathology
Bot 653	Forest and Shade Tree Pathology
Select one:	
Ento 402	Introductory Entomology
Ento 503	Principles of Applied Entomology
Ento 506	Forest Entomology
Select one:	
Bot 754	Principles of Plant Disease Control
Ento 722	Chemical Control of Insects
Ento 721	Principles of Biological Control
Required:	
PlSc 607	Weed Science
Required:	
Ento 726	Integrated Pest Management

General Science Certification

Students majoring in animal sciences, biochemistry, biology, botany, entomology, environmental conservation, forest resources, plant science, soil science, or wildlife management may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Degrees

Bachelor of Arts Students majoring in botany and plant pathology or in entomology may elect to earn either a bachelor of arts degree or a bachelor of science degree. The degree requirements in the College of Life Sciences and Agriculture for the bachelor of arts are almost the same as for a bachelor of science plus the addition of a foreign language requirement (see page 17 for B.A. degree requirements).

Bachelor of Science For the bachelor of science degree, a total of 128 credits* is required. In addition, students must complete the General Education Requirements found on page 15, obtain a written recommendation for graduation from their adviser, department chairperson, and college dean, and achieve a 2.00 cumulative grade-point average for all courses taken at the University of New Hampshire.

Some of the courses prescribed in the following degree programs partially fulfill the General Education Requirements. Students should see their adviser for specific information.

* The wildlife management major requires 132 credits.

Five-Year Program: B.S.-M.B.A. The College of Life Sciences and Agriculture and the Whittemore School of Business and Economics offer a combined five-year program leading to a B.S. in plant science and an M.B.A. degree. Information about the program can be obtained from the plant science department or from the undergraduate counselor in the Whittemore School.

Bachelor of Science in Forestry Students majoring in forest resources earn a professional degree designated as a bachelor of science in forestry. See page 46 for information.

Career Opportunities

The College of Life Sciences and Agriculture is unique in its diversity of programs to prepare graduates for careers in areas concerned with improving the quality of life. Preparation can vary from fundamental studies of cancer cells to community service planning, resource protection to genetic engineering, consumer advocacy to agricultural communications, and career teaching to molecular biology and biotechnology.

A blend of the basic and applied aspects of life sciences and agriculture, coupled with careful selection of supportive courses, ensures graduates the background and experiences necessary to be competitive in the job market. Potential employers include federal, state, and local governments, where graduates are employed as watershed, soil, and forest managers, associates in biomedical and agricultural research laboratories, marketing analysts and extension specialists, nutrition supervisors and environmental regulators, and information educators and communications experts.

Community governments employ graduates as service planners and land use specialists, teachers in traditional and vocational education, and public health technicians and urban pest control specialists.

Positions are available in private and commercial organizations in production agriculture, food processing, landscaping, agribusiness, sales, and private planning. Graduates may also pursue entrepreneurial careers as greenhouse, nursery, farm, and forest managers, or as consultants, arborists, and environmental planners.

For those graduates with international aspirations, the Peace Corps and the Foreign Agriculture Service employ farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

Additionally, departments prepare students for advanced study in their chosen field of interest where graduate study is required for attaining their career goals.

Major Programs

Animal Sciences

(For descriptions of courses, see page 100.)

The undergraduate animal sciences program at UNH provides students with fundamental and applied education in large animal management, nutrition, reproduction, genetics, physiology, pathology, and cell biology. Courses are offered in all areas of dairy, light horse, and livestock production.

The department maintains a light horse center and offers an equine program with courses in management, equine diseases, equine discipline, and horsemanship specializing in dressage and combined training. Dairy facilities include housing for more than 100 milking-age cows and the Ritzman Nutrition Laboratory, which is nationally known for its research contributions in dairy cattle nutrition. Beef cattle, sheep, and swine are maintained in a new livestock facility at the Burley-Demerritt farm. Extensive poultry facilities also permit research and teaching in poultry science. The animal sciences building, Kendall Hall, is a modern five-story animal research facility. This building houses the New Hampshire Veterinary Diagnostic Lab; an electron microscopy facility; and nutrition, physiology and cell culture labs, all of which provide opportunities for students interested in basic animal sciences.

The program consists of options in (1) animal production and agribusiness, (2) bioscience and technology, and (3) preveterinary medicine. In addition to satisfying the specific requirements of one of the three options, all animal science majors must complete certain courses to satisfy animal sciences and general University education requirements.

The department also offers a program in human nutrition. (See page 47.)

Students in the *Animal Production and Agribusiness Option* are encouraged to pursue one or more areas of concentration such as equine studies, dairy and livestock production, agribusiness, education, and/or journalism. This option permits students to design a curriculum for a particular career; e.g., cooperative extension, vocational education, sales and service, stable management, riding instruction, dairy herd management, or agricultural journalism.

Students in the *Bioscience and Technology Option* often specialize in nutrition, reproduction, genetics, or cell biology. This curriculum prepares students for advanced training in graduate school programs or in various medical professions; entry-level positions in biomedical, biotechnical, pharmaceutical, and other scientific companies; or technical positions in many research and medical units.

The *Preveterinary Medicine Option* is designed to meet the academic requirements of most veterinary schools. Requirements may be met within three years allowing students to apply to veterinary school during their senior year. However, most students finish their senior year, thus allowing more time for electives, concentration in areas of secondary interest, and completion of graduation requirements.

Employers in agriculture prefer to hire an agricultural graduate with extensive knowledge in a related field (e.g., computer science) rather than a graduate in one of these areas with no knowledge of agriculture. Hence, animal science students are

encouraged to obtain training in a field that complements study in animal sciences. Such areas may include cell biology, biotechnical skills, communications, computer science, education, or business. This is generally accomplished by taking either a concentration of courses or obtaining a minor in your "specialty" area. Attainment of sufficient training in a "specialty" area enhances opportunity for employment. A careers course is offered to help students select and prepare for a particular career area.

Development of optional career goals is important for preveterinary students. Admission to schools of veterinary medicine is highly competitive. Therefore, students in this option are urged to prepare for alternative careers as they complete preveterinary requirements.

All animal science majors are required to complete ANSc 401, 406, and 605; Chem 403-404; Engl 501; and Zool 412. In addition, the requirements in one of the three following options must also be completed:

Animal Production and Agribusiness Option Econ 402 or REco 411; Bot 412 or PlSc 421; Math 420, 425, or REco 528; ANSc 501; Bchm 501; ANSc 502 or Micr 503; ANSc 612; ANSc 620, 607, 617, or 614; ANSc 652, 550, 552, or 556; and ANSc 610 or 710.

Bioscience and Technology Option Phys 401-402; ANSc 612 or Zool 604; Math 425; Math 426 or REco 528; Micr 503; Zool 507-508 or 518-519; Chem 545, 546 or 651, 653; Bchm 656, or 751-752; and one 700-level ANSc course.

Preveterinary Medicine Option Phys 401-402; Math 425; Micr 503; ANSc 612 or Zool 604; Zool 507-508; Chem 651-652; and Bchm 656.

General Science Certification Students majoring in animal sciences may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Biochemistry

(For descriptions of courses, see page 106.)

Biochemistry is the study of chemistry of living organisms and of life processes. The program in biochemistry provides a fundamental education in chemistry and the biological sciences and includes basic courses in physics and mathematics.

Two curricula are offered to meet the educational requirements of students with differing professional goals.

Biochemistry Curriculum A provides intensive preparation in chemistry and biochemistry and basic courses in botany, zoology, microbiology, and genetics. This curriculum is recommended for students preparing for graduate study or for admission into professional schools of medicine, dentistry, or pharmacy. Students entering the curriculum should register for Chem 405-406, Math 425-426, Bot 412, and Zool 412 in the freshman year.

Biochemistry Curriculum B provides a fundamental education in chemistry and the biological sciences with enrichment in biochemical specialties including medical, analytical, marine, and nutritional biochemistry. It provides a strong educational background for technical employment in research and service programs of universities, medical schools, hospitals, research institutes, and industrial or government laboratories. Students entering this curriculum should register for Chem 403-404, Bot 412, and Zool 412 in the freshman year.

Students interested in a biochemistry major are advised to consult with the department chairperson as early as possible to assure the most effective curricular planning.

General Science Certification Students majoring in biochemistry may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Biology

(For descriptions of courses, see page 106.)

The interdepartmental biology major is described in the chapter on Special University Programs.

Botany and Plant Pathology

(For descriptions of courses, see page 107.)

The botany and plant pathology program explores the fundamental nature of plants. Botany graduates with suitable undergraduate backgrounds may enter the field of secondary education or find jobs with agricultural and pharmaceutical industry. Those students who have an interest in university teaching and/or research, governmental research, and advanced research positions with industry should expect to complete graduate education in the field.

The principal areas of concentration in the department are: 1) plant physiology; 2) cell biology; 3) ecology; 4) phycology, 5) freshwater biology; 6) biological oceanography; 7) plant pathology; 8) systematic botany; 9) plant anatomy and morphology; 10) mycology; 11) morphogenesis; and 12) plant biotechnology and genetic engineering.

Two botany and plant pathology degrees are offered: bachelor of science and bachelor of arts. Candidates for the bachelor of arts degree are required to take the following core of botany courses: 412, Introductory Botany (or equivalent); 503, The Plant World; 566, Systematic Botany; 606, Plant Physiology; and 758, Plant Anatomy, or 762, Evolution of Seed Plants. Also required are two botany electives, Zool 412, and one year of chemistry.

Candidates for the bachelor of science degree are required to take Bot 412, 503, 566, 606, 758 or 762, and Bot 601, Terrestrial Plant Ecology. Also required are three botany electives, one of which will be taken in the field of phycology, and one in the field of mycology/plant pathology; Zool 412; one year of general chemistry and either Chem 545, Organic Chemistry (and 546, Organic Chemistry Laboratory), or Bchm 501, Biological Chemistry; and PlSc 604, Principles of Genetics.

These required courses cannot be used to fulfill General Education Requirements. Majors must maintain a grade of C− (1.67) or better with a grade-point average of 2.00 in required courses. Beyond that, the program of each individual is selected by the student and adviser to meet particular needs.

Students interested in majoring in botany and plant pathology are invited to consult with Subhash C. Minocha, chairperson.

General Science Certification Students majoring in botany and plant pathology may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Community Development

(For descriptions of courses, see page 188.)

The community development program deals with broad aspects of community problem resolution, including applied economic, social, political, and technical matters. Communities are viewed as systems subject to meaningful analysis. Emphasis is placed on the community development process of helping people learn how to work together, organize their efforts, and analyze community problems in a democratic, decision-making framework. The curriculum takes an interdisciplinary approach and includes field experience as a vital component, along with classroom and independent study.

Students majoring in community development are encouraged to concentrate in one of the curriculum's specialized areas that include: community change and dynamics, community administration, community analysis, and community planning. These areas of specialty provide the necessary background and training to prepare graduates for entry-level positions with local governments and agencies throughout the nation. The community development program also provides a firm base for graduate study in a variety of areas such as: regional planning, public administration, rural sociology, economic development, and law.

The option of a minor in community development provides a unique opportunity for students to increase their scope of knowledge and to understand the broader application of their chosen major. The minor would complement majors in both technical fields and liberal arts. The department encourages both minors and dual majors.

Local communities are turning to individuals trained with a comprehensive perspective, since the problems and opportunities facing localities are varied. Those with a background in the arts and sciences who have had practical experiences are in demand by both public and private local groups concerned with community planning and development. While this program is suitable for preparing citizens for more effective leadership in their local community, employment opportunities are available in the United States, Canada, and in emerging nations.

Students interested in a community development major or minor may consult with the program coordinator, A. E. Luloff, James Hall, or with the chairperson of the Department of Resource Economics and Community Development.

Required Courses

I. All of the following (16 credits):

C D 507	Introduction to Community and Community Development
C D 508	Applied Community Development
REco 528	Applied Statistics (or its equivalent)
C D 795-796	Investigations in Community Development

II. One of the following (4 credits):

REco 506	Population, Food, and Resource Use in Developing Countries
Geog 583	Urban Geography

III. At least 8 credits of the following:

REco 606	Land Economics and Use
C D 614	Community Planning
C D 627	Community Economics and Finance
C D 628	Community Conflict and Consensus
C D 710	Community Development Seminar

IV. One of the following (4 credits):

C D 705	Planned Change in Nonmetropolitan Communities
C D 717	Law of Community Planning

V. Two courses from two of the following groups (at least 6 credits):

A: REco 702, Soil 709, or Biol 541
B: Soc 560 or Soc 745
C: Admn 712 or Admn 713

Courses (or their equivalents) expected to satisfy General Education Requirements:

Math 420	Finite Mathematics
Bot 412 or	Introductory Botany or
Zool 412	Principles of Zoology
REco 411	Resource Economics Perspectives
Arts 455	Introduction to Architecture
Soc 500	Introduction to Social Psychology
Engl 401	Freshman English
Engl 501	Introduction to Prose Writing
ThCo 403	Public Speaking

C D Minor Requirements:

C D 507	Introduction to Community and Community Development
C D 508	Applied Community Development
C D 795-796	Investigations in Community Development

One additional course selected from C D Group III.
One additional course selected from C D Group IV.

Entomology

(For descriptions of courses, see page 136.)

The Department of Entomology offers courses for students who wish to specialize in the study of insects and noninsect terrestrial arthropods, insect pest management, and insects in relation to people. There are employment opportunities for graduates in federal and state agencies, public institutions, and commercial and industrial firms in the areas of crop protection, forestry, conservation, and public health.

Students receive a fundamental education in the major fields of entomology, including general bi-

ology of insects and other arthropod groups, forest entomology, economic entomology, medical entomology, insect morphology, taxonomy, and insect pest management. Those who wish to specialize in chemical control of insects are expected to take courses in mathematics and chemistry. Outstanding students are encouraged to pursue graduate study.

Entomology majors are expected to complete 32 semester credits successfully in courses offered by the department. Courses in other departments may be taken in lieu of the above with the consent of the major adviser. Majors are required to take the following courses: Ento 402, 503, 705; Bot 412; Zool 412; Chem 403-404 and 545, 546 or Bchm 501; plus four courses from the following: Bot 566, 606, 651, 754; REco 528; Micr 501 (and 502) or 503; PlSc 421, 607, 651, 652, 653, 654; Zool 528, 721.

Students may earn either a bachelor of science or bachelor of arts degree in entomology.

Those contemplating a career in entomology are advised to consult with the chairperson of the Department of Entomology.

General Science Certification Students majoring in entomology may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Environmental Conservation

(For descriptions of courses, see page 138.)

The program in environmental conservation gives a broad background for understanding environmental and resource problems and their solutions. Economic activity within our biological ecosystems requires understanding of both areas, and development of policies and planning are essential to resolving environmental problems.

Students must develop a concentration related to career goals. The concentration consists of eight courses selected with the assistance of the faculty adviser from the offerings of the University. Concentrations center on a variety of conservation-related areas, such as land-use planning, ecological education, pollution control, writing about natural resources, etc. In addition, students must complete the 11 courses listed below, which make up the core of the environmental conservation program.

A minor of five courses in environmental conservation is available for students majoring in other areas. Permission is required.

The following 11 courses are required of all majors:

Bot 412	Introductory Botany
Zool 412	Principles of Zoology
Ecology electives	Two of the following: Biol 541, General Ecology; Bot 601, Terrestrial Plant Ecology; Bot 742, Physiological Ecology; FoRs 527, Silvics; Wild 533, Wildlife Ecology; Wild 672, Ecological Energetics; Zool 732, Soil Zoology
REco 411	Resource Economics Perspectives
Economics elective	One of the following: REco 676, Economics of Water Use and Quality Management; REco 606, Land Economics and Use; REco 611, Marine Resource Economics; REco 706, Economics of Resource Development; FoRs 643, Forest Economics; Econ 668, Economic Development
E C 635	Contemporary Conservation Issues
E C 702	Natural Resources Policy
FoRs 504	Freshwater Resources
E C 637	Practicum in Environmental Conservation: 4 credits. This practicum will be an independent project involving field work on an actual conservation activity during the senior year.
Speaking or writing course	A speaking skills course or a writing skills course (beyond Freshman English)

Students should plan to work for a master's degree if they wish to be professional conservationists. The undergraduate degree offers an education in environmental conservation with the opportunity for specialization or generalization in related fields.

All students must complete the University General Education Requirements.

Students interested in a major may consult with the program coordinator, John Carroll, James Hall.

General Science Certification Students majoring in environmental conservation may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Family and Consumer Studies

(For descriptions of courses, see page 137.)

The Department of Family and Consumer Studies offers specialized programs of study for students desiring professional careers emphasizing family advocacy. Each program and option has entry-level criteria and unique course requirements. All require close consultation with a faculty adviser.

Child and Family Studies Students desiring to work in settings providing services to children and/or families construct an individual plan of studies in this option congruent with their specific professional goals.

Consumer Studies Students desiring careers as consumer affairs professionals in business or governmental agencies consult with their adviser to design an individualized plan of studies in this option congruent with their career objectives.

Early Childhood This program has been approved by the New Hampshire State Board of Education to prepare students for certification as nursery/kindergarten teachers. Students must apply to the department for this program by spring semester of their junior year.

Family Internship This program allows senior FCS majors an opportunity to work in a community agency providing direct services to families.

Interns will apply knowledge gained from their academic studies in a supervised environment. Students who have completed appropriate background courses must apply for internships during fall semester of their senior year.

The early childhood and family internship programs are highly structured and have limited enrollments. Acceptance to these programs is restricted to students demonstrating exceptional potential for working with children and families.

Home Economics Education Students interested in certification for teaching home economics at the secondary level are encouraged to apply through the Department of Education for the fifth-year program. (See page 23.)

All FCS students must complete University and college requirements for a bachelor of science degree. Departmental requirements include a minimum of nine FCS courses (36 credits). In addition, students are required to take a minimum of seven approved courses (28 credits) in related fields, selected in consultation with their advisers. These courses and electives help students fulfill specific career objectives in their areas of professional specialization.

The department offers a minor to interested students in related majors. Students desiring further information are advised to consult with the departmental administrative assistant as early as possible.

Forest Resources

(For descriptions of courses, see page 138.)

The forest resources program has the objective of combining a basic education with technical forestry education to meet the needs of professional foresters. The forest management and forest science options of the forest resources major leading to the bachelor of science in forestry degree (B.S.F.) are approved and accredited by the Society of American Foresters (SAF). The SAF is recognized by the Council on Postsecondary Accreditation and the U.S. Department of Education as the accrediting body for forestry in the United States.

Professional foresters are employed in a variety of forest-land management and wood-utilization positions. Some graduates work with natural resource protection and the improvement of environmental quality. Others are employed in the production and utilization of raw materials; still others become involved with wildlife, watershed, and recreation management. There are rapidly expanding opportunities in urban forestry.

Technical, administrative, and managerial skills are required of most professional foresters. This program provides a foundation in scientific knowledge, as well as technical and managerial skills, with elective freedom to cultivate special abilities and interests. The curriculum leads some students into graduate studies; these opportunities may be enhanced by careful selection of suitable courses in the undergraduate program.

Students majoring in forestry must complete at least 137 credits for the degree of bachelor of science in forestry. The University General Education Requirements (11 courses) may be partially met by completing the required courses in the forestry program, but the student is required to complete the remaining general education requirements in order to qualify for graduation.

Besides these formal courses, all forestry majors are required to have at least one summer of forestry work experience (FoRs 500). Students are responsible for their own summer work, though assistance is available from the faculty.

In addition to the normal University fees and tuition, forest resources students are required to pay certain course transportation fees and the cost of meals in connection with some planned field sessions.

Before the junior year, students must choose a single area of concentration from the following options and must earn 28 credits within that concentration.

Forest Management Option This option is designed for students who intend to develop a career in forest resource management. Requirements: FoRs 753, Quantitative Methods for Forest Resource Management; FoRs 754, Wood Products Manufacture and Marketing; FoRs 798, Resource Management Seminar; LM T 661, Tourism and Park Management; one course in administration, 500 level or higher; two courses (8 credits) in advanced forestry, wildlife, hydrology, soils, resource management, urban forestry, or administration.

Forest Science Option In this option, students may prepare for specialization in specific forest sciences, primarily as background for entry to graduate study. There are concentrations identified in three areas: biological science, wood science, and quantitative science. Specific course requirements will be established by the forestry faculty.

Freshman Year		Fall	Spring
FoRs 400*	Orientation in forestry	0	—
FoRs 423	Dendrology	2	—
FoRs 425	Field Identification of Trees and Shrubs	2	—
FoRs 426	Wood Science and Technology	—	4
Engl 401	Freshman English	4	—
Bot 412	Introductory Botany	(4)	4
Math 425	Calculus I	4	—
Engl 501	Introduction to Prose Writing	—	4
REco 528	Applied Statistics I	—	4
FoRs 542	Forestland Measurement and Mapping	—	2
Elective	General Education Requirement	(4)	—
		16	18
Sophomore Year			
FoRs 527	Silvics	4	—
FoRs 644	Forest Mensuration	—	4
Soil 501	Soils and the Environment	4	—
Chem 403	General Chemistry	4	—
Ento 506	Forest Entomology	—	4
C S 410	Introduction to Computer Programming	—	2

REco 411 or Econ 402	Resource Economics Perspectives or Principles of Economics (micro)	(4)	4
Wild 533	Wildlife Ecology	4	—
Elective	General Education Requirement	—	4
FoRs 500	Summer Work Experience	0	—
		16	18
Junior Year			
FoRs 629	Silviculture	3	—
FoRs 643	Forest Economics	4	—
FoRs 652	Forest Resources Measurements and Mapping	—	2
Bot 653	Forest and Shade Tree Pathology	4	—
FoRs 660	Forest Fire Protection	—	2
FoRs 757	Basics of Remote Sensing	—	2
Electives	General Education Requirement	4	8
Option Requirement	(Management or Science)	2	4
		17	18
Senior Year			
FoRs 745	Forest Management	4	—
FoRs 603	Hydrology and Water Management	4	—
Social Science Electives	(C D 507, E C 702, or E C 718)	4	—
Electives	General Education Requirement	—	4
Option Requirement	(Management or Science)	6	12
		18	16

*FoRs 400 is required of all forestry majors.

Students interested in the forestry program may consult with Richard Weyrick or James Barrett.

General Science Certification Students majoring in forest resources may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

General Studies

General studies is a flexible curriculum for students with a broad, general interest in several areas of life sciences and agriculture. It cuts across departmental lines and in some respects resembles a self-designed major. It is not intended to be a catch-all for students from other colleges but is designed to serve the needs of Life Sciences and Agriculture students. Students majoring in general studies should take Chem 403-404; Zool 412; and Bot 412 or PlSc 421. Six additional courses in the college (or closely related courses approved by the adviser), two of which must be at the 600 level or above, are required. These courses should be interrelated in such a way that they will help students meet their goals for employment or further study.

Freshmen who are unsure of a major should not declare general studies as a major but should remain undeclared for a semester or two. See p. 41.

Nutritional Sciences

(For descriptions of courses, see page 170.)

The science of nutrition is the study of the nutrients in food and the body's handling of these nutrients. As an applied science, nutrition is based mainly on biochemistry and physiology and also encompasses aspects of other sciences such as anthropology, economics, genetics, mathematics, microbiology, pathology, animal sciences, and zoology. Consequently, the nutritionist must cooperate with workers in many different fields. The integrated nutrition program at UNH is designed to permit specialized study in human and/or animal nutrition.

Students interested in careers in the nutritional sciences are required to complete a core of basic courses in the biological and physical sciences while taking specialized courses in nutrition. This curriculum plan, which has been approved by the American Dietetics Association (ADA), prepares the student to apply for a dietetic internship while meeting the requirement for a B.S. degree in nutritional sciences. Completion of such an internship is recommended for advanced membership in the ADA and is a requisite for employment opportunities in clinical dietetics and community nutrition. The curriculum plan will also allow students to receive a B.S. degree in nutritional sciences while fulfilling requirements for admission into graduate programs in biological research, medical school, and schools of dentistry.

Core Requirements

Chem 403-404, 545 and 546, or 651-652
Zool 507-508 or 518-519
Engl 401 and 501
Bchm 656 or 751-752
Nutr 475 plus 12 additional credit hours from recommended courses in nutrition

Plant Science

(For descriptions of courses, see page 180.)

Students interested in plants and their use for food, feed, fiber, recreation, or ornamental purposes may major or minor in plant science. A core curriculum of physical and biological sciences is required. Students may then select courses that relate these sciences to their specific interests. Two curriculum options, the science option and the industry option, are offered to plant science majors. The following courses or their equivalents are required for these options:

		Science Option	Industry Option
PlSc 401	Plant Science Orientation	x	x
PlSc 421	Concepts of Plant Growth	x	x
PlSc or Zool 604	Principles of Genetics	x	x
PlSc 606 or Bot 606	Plant Physiology	x	x

PlSc 566, 607, 651, 652, 653, 654, or 678	Elective in Crop Production		x
PlSc 672	Plant Propagation	x	x
PlSc 795 or 796	Elective in Special Topics	x	
Math 425-426	Calculus I and II	x	
Phys 401-402	Introduction to Physics I and II	x	
Chem 403-404	General Chemistry	x	x
Chem 545, 546	Organic Chemistry	x	
Chem 545, 546 or Bchm 501	Organic Chemistry or Biochemistry		x
Micr 503	General Microbiology	x	
Ento 402	Introductory Entomology	x	x
Soil 501	Soils and the Environment	x	
Soil 501 or Soil 502	Soils and the Environment Soil-Plant Relationships		x
Bot 412	Introductory Botany	x	x
Bot 651 or 653	Plant Pathology or Forest and Shade Tree Pathology	x	x
REco 528 or 701	Applied Statistics I Statistical Methods I	x	

Students in the industry option are required to take one minor.

Because of the diversity of employment possibilities, the industry option curriculum is flexible. Students will find opportunities in management of farms, greenhouses, golf courses, or nurseries; teaching; journalism; park or highway planning commissions; sales or brokerage aspects of wholesale and retail marketing; and food and feed processing firms. Students should pursue the science option to prepare for graduate study and careers in research or teaching. Minor programs in administration, economics, English (journalism program), leisure management and tourism, or vocational/technical and adult education can be tailored to accommodate specialized interests and complement fundamental requirements.

Students interested in a plant science major or minor may consult with the department chairperson, Owen M. Rogers.

A five-year dual-degree program leading to a B.S. degree in plant science and an M.B.A. degree (business administration) is available. Superior students preparing for a business career in agricultural enterprises should notify the department of their interest in their sophomore year. They will be considered for Graduate School enrollment in their junior year.

General Science Certification Students majoring in plant science may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Resource Economics

(For descriptions of courses, see page 189.)

This program offers training in resource economics, including public resource policy, resource management, natural resource economics, and community economics and finance. Training is also available in agricultural economics, including agribusiness, farm management, food marketing, agricultural policy, and world food supplies.

Students majoring in resource economics will normally concentrate in one of the following three areas: natural resource economics, agricultural economics or community economics. In addition, students must satisfy General Education Requirements, which lead to a broad university education. Majors interested in the economic or business aspects of agriculture will be expected to take courses in the animal sciences and plant science departments.

Students majoring in any of the social sciences, life sciences, and agriculture departments of the University may find it to their advantage to elect courses or a minor in resource economics or agribusiness. By doing so, their basic training can be supplemented in a specific area of interest, such as farm management and agricultural marketing for agricultural majors, resource development and natural-resource policy for social science majors, and community economics and finance for students interested in local government and development.

Required Courses

All of the following:

Engl 401	Freshman English
Econ 401	Principles of Economics (Macro)
Soc 400 or Polt 401	Introductory Sociology* Politics, Morality, and Community*
ThCo 403	Public Speaking
Admn 517	Survey of Basic Accounting
Bot 412	Introductory Botany
Zool 412	Principles of Zoology*
Soil 501 or FoRs 504	Soils and the Environment* Freshwater Resources*
REco 411	Resource Economics Perspectives
Math 420 or 425	Finite Mathematics Calculus I
Econ 605	Intermediate Microeconomic Analysis
Econ 611	Intermediate Macroeconomic Analysis
REco 528 or REco 701	Applied Statistics I Statistical Methods I

At least six of the following, of which two must be 700 level†:

REco 501	Agricultural and Natural Resource Product Marketing
REco 504	Farm Business Management
REco 506	Population, Food, and Resource Use in Developing Countries
REco 604	Agribusiness Finance
REco 606	Land Use Economics
REco 611	Marine Resource Economics
REco 615	Linear Programming Methods
REco 627	Community Economics and Finance
REco 676	Economics of Water Use and Quality Management
REco 706	Economics of Resource Development
REco 708	Environmental Economics
REco 710	Resource Economics Seminar
REco 756	Regional Economic Analysis

*or equivalent to satisfy General Education Requirements
†a grade of C− or better required

Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. Private business, public institutions, and government agencies currently have a strong demand for specialists trained in agricultural, fisheries, and forestry marketing; natural resource development, community development, and land and water use policy; extension work; resident teaching; and farm management. In many cases, students may wish to improve their qualifications by pursuing more specialized graduate studies in one or more of the above areas.

Students interested in a major or minor in resource economics or agribusiness may consult with the department chairperson, Edmund F. Jansen, Jr., James Hall.

Soil Science

(For descriptions of courses, see page 141.)

Soil scientists are concerned with proper management of our soil resources, both in rural and urban environments, and with the essential role of soil in food and fiber production.

Graduates of the soil science program are qualified for many private-sector and government positions. Opportunities are particularly good for individuals desiring a career in consulting. There is a growing awareness that planning, design, and construction of public and private facilities must be compatible with the soil upon which these facilities are placed. Thus, the increasing urbanization of the Northeast has created a demand for soil scientists competent to advise on soils considerations during planning and development stages. There is also a growing role for soil scientists who wish to work with plant scientists and foresters in improving food and fiber production.

Students in the soil science program are given a strong analytical background for studying physical, chemical, and biological properties of soils, as well as their classification and management. Graduates are well prepared for further study in graduate school and certification is available through the American Registry of Certified Professionals in Soils.

Required Courses

ESci 401	Principles of Geology I
Bot 412	Introductory Botany
Bot 606	Plant Physiology
Chem 403-404	General Chemistry
Chem 406, 407	Quantitative Analysis
Soil 501	Soils and the Environment
Soil 602	Chemical Analysis of Soils
Soil 702	Chemistry of Soils
Soil 704	Soil Classification and Mapping

at least eight of the following (or equivalents):

Phys 401-402	Introduction to Physics I and II
Math 425-426	Calculus I and II
C S 410	Introduction to Computer Programming
ESci 762	Glacial Geology
Ci E 665	Soil Mechanics
REco 528	Applied Statistics I
FoRs 711	Statistical Methods II
FoRs 757	Basics of Remote Sensing
FoRs 758	Terrain Analysis
Soil 502	Soil-Plant Relationships
Soil 601	Soil Morphology
Soil 605	Forest Soils
Soil 614	Soil Management
Soil 795-796	Independent Work in Soil Science

Students interested in the soil science major should consult with Robert Harter.

General Science Certification Students majoring in soil science may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Vocational/Technical and Adult Education

(For descriptions of courses, see page 204.)

The Department of Vocational/Technical and Adult Education focuses on the preparation of students: as teachers of vocational/technical education, as participants in international agricultural education, as extension educators, and as adult educators concerned with human resource development.

This program complements a student major in technical subject matter within departments throughout the University and thus can serve as a viable dual major or minor.

Flexibility is maintained among individual programs, with credits allowed for qualified students under the Occupational Competency Testing and Evaluation program and through internships in industry, with the Cooperative Extension Service, and within other informal educational settings. Opportunity is provided for vocational teacher certification.

Students who desire to major or minor in vocational/technical and adult education should consult with a member of the faculty of the department.

Students majoring in vocational/technical and adult education will normally concentrate in one of four areas, although programs for teacher education can be developed in other areas of vocational/technical education on an individual basis.

Areas of concentration include:

Agricultural Education Teacher Certification* This program prepares individuals for careers as teachers of general and vocational agriculture. Individuals completing this concentration are eligible for state certification in New Hampshire and most other states.

Individuals are encouraged to complete a dual major in a technical agricultural field. For further information, contact William H. Annis or David L. Howell.

Vocational/Technical and Adult Education Required Courses

		Credits
VTAE 498	Options in Vocational/Technical and Adult Education Seminar	0–2
VTAE 550	Introduction to Vocational/Technical and Adult Education	4
VTAE 650	Microteaching	4
VTAE 652	Introduction to Youth Organizations	4

VTAE 666	Teaching Vocational Education to Students with Special Needs	4
VTAE 791	Planning for Teaching	4
		20–22

Education Required Courses

Educ 500	Exploring Teaching	4
Educ 700	Educational Structure and Change	4
Educ 701 or FCS 525	Human Learning and Development/Human Development	4
Educ 705	Alternative Perspectives on the Nature of Education	4
Educ 694B	Supervised Teaching in Occupational Education	8
		24

The technical agriculture courses would be selected from within the following areas.

1) Animal science
2) Plant science
3) Agricultural mechanization
4) Resource economics
5) Entomology
6) Botany
7) Forestry (5th year program)
8) Some courses from the Thompson School of Applied Science or similar out-of-state institutions may be appropriate.

Additional Programs

Programs for teacher education can be developed in other areas of vocational/technical education on an individual basis.

*Recent occupational experience in the field of production agriculture or agribusiness is required for state certification.

Trade and Industrial Teacher Certification* Trade and industrial education, with emphases in, but not limited to, building trades, mill carpentry, welding, and food service, is formulated in three categories of courses to fulfill degree requirements. The degree requirements are 44 credits in general education, 44 credits in professional education, and 40–50 credits in technical subject matter or documented recent occupational experience. Technical subject matter is culminated in a competency test where credit (up to 30 credits) is awarded for successful completion of a written and practical exam. For further information, contact Gregory Gill.

Vocational/Technical and Adult Education Required Courses

		Credits
VTAE 498	Options in Vocational/Technical and Adult Education Seminar	0–2
VTAE 550	Introduction to Vocational/ Technical and Adult Education	4
VTAE 650	Microteaching	4
VTAE 666	Teaching Vocational Education to Students with Special Needs	4
VTAE 791	Planning for teaching	4

Required Education Courses

Educ 500	Exploring Teaching	4
Educ 700	Educational Structure and Change	4
Educ 701 or FCS 525	Human Learning and Development/Human Development	4
Educ 705	Alternative Perspectives on the Nature of Education	4
Educ 694B	Supervised Teaching in Occupational Education	8

Technical Courses

VTAE 696	Field Experience
VTAE 500	Competency Exam

If candidates have had prior occupational experience, the competency exam will be used as a tool to evaluate occupational experience.

*Recent occupational experience in the field of specialization is required for state certification.

International Agricultural Education This program prepares individuals for careers in international agriculture. The Peace Corps; U.S. Agency for International Development; and private agencies, business, and industry would be possible overseas employment opportunities. For further information, contact David L. Howell.

Vocational/Technical and Adult Education Required Courses
27 credits minimum

		Credits
VTAE 498	Options in Vocational/Technical and Adult Education Seminar	0–2
VTAE 550	Introduction to Vocational/ Technical and Adult Education	4
VTAE 650	Microteaching	4
VTAE 652	Introduction to Youth Organinzations	4
VTAE 666	Teaching Vocational Education to Students with Special Needs	4
VTAE 696	Field Experience	8–16
VTAE 730	Development of Food and Fiber in Third World Countries	3
VTAE 783	Conducting and Supervising Adult Education Programs	4

Technical Agriculture* (44 credits)

8–20 credits	Animal science
8–20 credits	Plant & soil science
8–20 credits	Agribusiness
8–20 credits	Agricultural mechanization

*One area should include 20 credits; each of the others, 8.

Recommended International Courses

PIP 401	International Perspectives: Science, Business, and Politics
PIP 501	North-South Issues in International Affairs
Anth 500	Peoples and Cultures of the World
REco 506	Population, Food, and Resource Use in Developing Countries
	Foreign language

Extension Education This program prepares students for careers with the Cooperative Extension Service and within other informal educational settings. It includes opportunity for selected formal courses and for field experience valuable for the

student's professional development. The most beneficial focus in this area may be a dual major or minor along with concentration in a technical subject matter field within the College of Life Sciences and Agriculture or within other colleges and schools of the University. For further information, contact Maynard C. Heckel.

Vocational/Technical and Adult Education Required Courses		Credits
VTAE 498	Options in Vocational/Technical and Adult Education Seminar	0–2
VTAE 550	Introduction to Vocational/ Technical and Adult Education	4
VTAE 650	Microteaching	4
VTAE 695	Investigations in Vocational/ Technical and Adult Education	2–4
VTAE 696	Field Experience	16
VTAE 783	Conducting and Supervising Adult Education Programs	4
VTAE 790	Programming in Extension and Adult Education	4
Recommended Courses		
C D 507	Introduction to Community and Community Development	4
C D 705	Planned Change in Non-metropolitan Communities	4
C D 710	Community Development Seminar	2–4
Soc 560	Rural-Urban Sociology	4
Soc 500	Introduction to Social Psychology	4
Psyc 401	Introduction to Psychology	4
REco 504	Management of Farm & Related Resource-Based Business	4
REco 604	Agribusiness Finance	4

Wildlife Management

(For descriptions of courses, see page 141.)

The wildlife management curriculum is for students whose interest is in the understanding, management, and production of wildlife species. The curriculum provides a knowledge of wildlife and of the total forest and field environment of which they are a part. It also prepares students for possible employment with public and private agencies in wildlife management and ecology, and it is a base for graduate study, which is needed for research and teaching.

The degree earned is a bachelor of science with a major in wildlife management. The program is administered in the Department of Forest Resources.

Field work is carried out during the academic year on wildlife areas near the campus. Each June, a two-week session is held for all students who have completed the sophomore year. There is no additional summer camp. In addition to the normal University fees and tuition, students are required to pay transportation and meal charges in connection with regularly planned field sessions.

Freshman Year		Fall	Spring
Bot 412	Introductory Botany	4	—
Wild 533	Wildlife Ecology	4	—
Chem 403	General Chemistry	4	—
Engl 401	Freshman English	4	—
Zool 412	Principles of Zoology	—	4
Math 420 or Math 425	Finite Mathematics or Calculus I	—	4
Bot 566	Systematic Botany	—	4
C S 410	Introduction to Computer Programming	—	2
Elective		—	4
		16	18
Sophomore Year			
ANSc 501	Animal Anatomy and Physiology	4	—
Wild 515	Wildlife Habitat	3	—
REco 411	Resource Economics Perspectives	—	4
REco 528	Applied Statistics I	—	4
Zool 542	Ornithology	—	4
Engl 501	Introduction to Prose Writing	4	—
Electives		5	4
		16	16
Spring Field Session (June)			
FoRs 542	Forestland Measurement and Mapping	—	2
Junior Year			
Zool 712	Mammalogy	4	—
Wild 635	Wildlife Management Techniques	2	—
Bot 601	Plant Ecology	4	—
Wild 672	Wildlife Energetics	—	2
Wild 636	Wildlife Biology	—	2
FoRs 629	Silviculture	4	—
ANSc 614	Disease and Parasites of Wildlife	—	4
Wild 609, 610	Wildlife Seminar	Au	Au
Electives		4	8
		16	16
Senior Year			
Wild 737	Wildlife Population Dynamics	4	—
Wild 738	Wildlife Management	—	4
Wild 609, 610	Wildlife Seminar	2	2
Wild 695	Wildlife Research	1	—
Electives		9	12
		16	18

Students interested in the wildlife management major may consult with the program coordinator, William Mautz, Pettee Hall.

General Science Certification Students majoring in wildlife management may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

College of Engineering and Physical Sciences

Otis J. Sproul, Dean
Donald W. Melvin, Associate Dean

Departments

Chemical Engineering
Chemistry
Civil Engineering
Computer Science
Earth Sciences
Electrical and Computer Engineering
Mathematics
Mechanical Engineering
Physics

Programs of Study

Bachelor of Science

Chemical Engineering*
  Energy
  Environmental Engineering
Chemistry*
Civil Engineering*
  Constructed Systems
  Environmental Engineering
Computer Science*
Electrical Engineering*
  Computer Engineering
  Electrical Engineering Systems
  Student-Designed Option
Geology*
Mathematics*
Mathematics Education*
  Elementary
  Secondary
Mathematics (Interdisciplinary)
  Mathematics—Chemistry
  Mathematics—Computer Science
  Mathematics—Economics
  Mathematics—Electrical Science
  Mathematics—Fluid Dynamics
  Mathematics—Mechanics
  Mathematics—Statistics
  Mathematics—Thermodynamics
  Mathematics—Physics
Mechanical Engineering*
  Energy
Physics*

Bachelor of Arts

Chemistry
Chemistry and Physics Teaching
Earth Science Teaching
Geology
Mathematics
Physics

Bachelor of Engineering Technology

Electrical Engineering Technology
Mechanical Engineering Technology

*Designated degree (the name of the specialization is included on the diploma; e.g., B.S. in Chemistry)

Purposes and Programs

The College of Engineering and Physical Sciences seeks to provide an optimal opportunity for students to achieve educational objectives appropriate to their interests in engineering, mathematics, and the physical sciences. The college offers a vigorous professional education in each of its nine primary disciplines leading to the bachelor of science, and a broad liberal education coupled with majors in mathematics and each of the three physical sciences leading to the bachelor of arts. All programs include an opportunity for study in the arts, humanities, and social sciences.

The key to an undergraduate program in the college is flexibility, with a strong emphasis on personal and individualized education. In addition to specific programs, a number of options are available. Special programs can be developed to meet the specific interests of individual students.

Math 425 and 426 (Calculus I and II) or the equivalent in transfer credits or advanced placement approved by the Department of Mathematics are required by all departments of the college for their majors. Prerequisites for calculus are three years of college-preparatory mathematics, including a half-year of trigonometry.

Accreditation

The baccalaureate-level programs in chemical, civil, electrical and computer, and mechanical engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. The baccalaureate-level programs in electrical and mechanical engineering technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Degrees

Bachelor of Science

The programs leading to the bachelor of science degree, offered in each of the departments of the college, emphasize the preparation of students for a professional career and continuing or graduate education.

The degree requirements for the bachelor of science include the University General Education Requirements (page 15) and the specific departmental requirements for graduation. A minimum grade-point average of 2.00 must be achieved. Graduation credit requirements established by the departments range from 128 to 137. There are enrollment limitations in some programs, and it is not possible to guarantee all change of major requests.

Bachelor of Arts

Programs leading to a bachelor of arts degree are offered in the departments of chemistry, earth sciences, mathematics, and physics. These programs provide a broad liberal education along with a major in one of these fields. The University requirements for the bachelor of arts degree are on page 17.

Bachelor of Engineering Technology

The engineering technology program emphasizes applied engineering in two curricula, electrical and mechanical technology. The program enables the student with an appropriate associate degree from an A.B.E.T. accredited technical institute to obtain a B.E.T. degree in electrical or mechanical engineering technology in two years at UNH. This program emphasizes design and applications and uses the latest techniques and equipment. Student projects and liaisons with New Hampshire industries further enrich the program.

Five-Year Program: B.S.-M.B.A.

The College of Engineering and Physical Sciences and the Whittemore School of Business and Economics offer a joint program leading to a bachelor of science (B.S.) in chemical engineering, civil engineering, electrical engineering, or mechanical engineering and a master of business administration (M.B.A.) in five years rather than the normal six. In order to receive both degrees in five years, students in the program may have to take more than 16 credits per semester in several semesters (though no more than five courses or 20 credits). Provision has been made to count 14–24 credits toward both undergraduate and graduate degree requirements. All other University and departmental requirements for each degree must otherwise be met.

The program first "pre-admits" qualified students to take one M.B.A. course in each semester of their junior year. The pre-admission process should be completed by April 1 of the sophomore year. The program is carried out jointly by representatives from the Whittemore School and the College of Engineering and Physical Sciences. Juniors enrolled in the program should submit a formal application to the Graduate School (in the second semester of the junior year) in order to be admitted to the M.B.A. program by March 1; they will be judged by academic standards with special emphasis on maturity and experience.

Most of the fourth year is occupied by core M.B.A. courses, while the fifth year is used for M.B.A. electives (some of which might be taken in the undergraduate major department) and for completing all requirements for the undergraduate degree. The M.B.A. will be granted only if the bachelor's degree requirements are successfully completed.

The details of each student's curriculum are worked out jointly with the departmental undergraduate B.S. adviser and with an adviser for the M.B.A. program.

Undergraduate advisers: Stephen S.T. Fan, chemical engineering; Robert Henry, civil engineering; Fletcher A. Blanchard, electrical and computer engineering; Godfrey Savage, mechanical engineering. M.B.A. advisers: George Abraham, Barbara Coakley, Whittemore School.

Interdisciplinary Minors

Interdisciplinary minors have been developed in biomedical engineering, environmental engineer-

ing, hydrology, materials science, ocean engineering, and oceanography. These programs will enable students to obtain experience in the specialized area and to retain identification with their major professional area. (For University requirements, see page 18.)

Biomedical Engineering

The biomedical engineering minor encompasses the application of engineering science and technology, as well as problem-solving techniques, to the fields of medicine and biology. Biomedical engineers participate in the development of diagnostic and therapeutic medical instrumentation, physiological sensors, prosthetic devices, biomaterials, clinical instrumentation systems, and the application of computers to medical problems. Biomedical engineers generally continue their studies at the graduate level and/or find employment in health-related industries and medical centers.

Engineering students electing this minor must complete the curriculum prescribed below. Since upperclass engineering curricula are heavily loaded with major courses, students should begin the program as early as possible to complete the zoology courses. An "Intent to Minor" form should be obtained from the dean's office and returned by the end of the sophomore year. During the final semester, application should be made to the dean to have the biomedical engineering minor shown on transcripts.

Required courses include: Zool 507-508, Human Anatomy and Physiology (or Zool 518, 519); E E 787, Human Physiological Control Systems; E E 784, Biomedical Instrumentation (or approved elective for non-ECE students); and Ch E 695, E E 695, or M E 696 (a biomedical engineering research project), normally to be completed over a two-semester period for a total of 4 credits.

Students intending to pursue the minor should consult early in their freshman year with the biomedical engineering minor adviser, Glen C. Gerhard.

Environmental Engineering

The environmental engineering minor is intended primarily for students in engineering and physical sciences. Students contemplating such a minor should plan on a strong background in the sciences and mathematics (including differential equations).

The minor provides a comprehensive introduction to major areas of interest in environmental protection, namely air pollution and water pollution, through the three required courses. Further breadth in environmental engineering or depth in specific areas can be attained through the choice of appropriate elective courses.

Requirements for the minor include a total of at least 20 credits from the following: 1) three required courses: Ch E 609, Fundamentals of Air Pollution and Its Control; Ci E 643, Engineering Aspects of Environmental Pollution Control; Ch E 772, Physiochemical Processes for Water and Air Quality Control, or Ci E 644, Water and Wastewater Engineering; 2) a minimum of two elective courses from the following list: Ch E 604, Chemical Engineering Thermodynamics; Ch E 605, Mass Transfer and Stagewise Operations; Ch E 606, Chemical Engineering Kinetics; Ch E 772, Physiochemical Processes for Water and Air Quality Control; Ci E 644, Water and Wastewater Engineering; Ci E 740, Rural Wastewater Treatment; Ci E 743, Environmental Sampling and Analysis; Ci E 744, Environmental Limnology; Ci E 746, Wastewater Treatment Plant Design; Ci E 747, Introduction to Marine Pollution and Control; Ci E 748, Solid Waste Disposal; Ci E 749, Water Chemistry; Ci E 742, Hazardous Waste Management; Ci E 755, Design of Water Transmission Systems; Ci E 756, Wastewater Microbiology; 695, Engineering Projects (Ch E, Ci E, E E, M E).

Choice of elective courses should be made in consultation with the minor area adviser, Nancy Kinner, Ci E, or Stephen S. T. Fan, Ch E. Students normally start this program in the junior year and should declare their intention to enter the program as early as possible during the sophomore year. Prior to the final term, students should apply to the dean to have the minor shown on the transcript.

Hydrology

The minor in hydrology is open to all students in the University. It consists of 20 semester hours. Students must earn grades of C (2.00) or better and take no pass/fail courses. No more than 8 major requirement credits may be used. All courses in the program shall be selected by students in consultation with the hydrology minor adviser in the earth sciences department.

Required courses include: 1) ESci 401, Principles of Geology I, or ESci 409, Environmental Geology; 2) at least two of the following: FoRs 603, Hydrology and Water Management; ESci 705, Principles of Hydrology; ESci 710, Groundwater Hydrology; 3) any of the following courses: ESci 561, 703, 734, 762; Ci E 643, 741, 742, 744, 745, 749; FoRs 504, 757, 758; REco 676; Bot 717, 719; Soil 501 and 502.

Students are encouraged to declare their intention to enter the program before the end of the junior year. During the final term, students should apply to the dean to have the minor shown on the transcript.

Materials Science

The minor is open to all students of the University. It offers a broad introduction to materials science. The minor is administered by the Department of Mechanical Engineering. Students should contact the minor supervisor by mid-semester of their junior year.

The students must complete at least 20 credits consisting of five courses as follows; required courses M E 561 with M E 545 or Ci E 622 with Lab; two courses from the group M E 760, M E 766, and Chem 545; additional courses from the group M E 564, 695 (materials), 696 (materials), 730, 760, 766, ESci 512, 513, Chem 517, 518, 545.

Interested students may consult Frederick G. Hochgraf, Department of Mechanical Engineering.

Ocean Engineering

The ocean engineering minor recognizes undergraduate engineering students who acquire a nucleus of knowledge about engineering pertaining to the ocean and the coastal zone.

In addition to meeting the University minor requirement of 20 semester hours, students must complete satisfactorily a minimum of five courses from the following list: ESci 501, Introduction to Oceanography; ESci 752, Chemical Oceanography; ESci 758, Introduction to Physical Oceanography; ESci 759, Geological Oceanography; O E 710, Ocean Measurements Laboratory; O E 753, Ocean Hydrodynamics; O E 754, Ocean Waves; O E 761, Materials in the Ocean; O E 781, Physical Instrumentation; O E 785, Underwater Acoustics; O E 795, Independent Study; O E 751, Naval Architecture in Ocean Engineering; O E 752, Submersible Vehicle Systems Design; O E 757, Coastal Engineering and Processes; and Tech 697, Ocean Projects. Ordinarily, students must take ESci 501, Tech 697, and additional courses from the above list, for a total of 20 semester hours. Two of these courses must be engineering courses.

Students wishing to take the ocean engineering minor should indicate their interest to their department chairperson no later than the beginning of the junior year. They will be assigned to their departmental ocean minor adviser, who will assist in planning courses.

Oceanography

The minor in oceanography, available to all students in the University, consists of 20 semester hours with grades of C (2.00) or better and no pass/fail courses. No more than eight major requirement credits may be used. Students may not elect minors in both ocean engineering and oceanography. All courses in the program shall be selected in consultation with the oceanography minor adviser, T. C. Loder in the Department of Earth Sciences.

Required courses include: 1) ESci 501, Introduction to Oceanography; 2) two of the following courses: ESci 752, Chemical Oceanography; ESci 758, Introduction to Physical Oceanography; ESci 759, Geological Oceanography; 3) any two of the following courses, or a suitable substitute approved by the minor adviser (it is advisable that at least one of the courses be in the biological sciences): Bot 625, 722, 723; Ci E 747, 757; E E 785; ESci 754, 756; E C 611; M E 695, 737, 738, 751, 752, 757; Micr 707, 708; Polt 511; Tech 697; Zool 560, 674, 715, 720, 751, 753, 772, 775.

Students are encouraged to declare their intention to enter the program before the end of the junior year. During the final term, students should apply to the dean to have the minor shown on the transcript.

Other Programs

Independent Study and Projects All departments within the college offer courses in independent study or in projects, the content varying with the current scientific and technological needs and with student and faculty interest.

Permission of the instructor and/or the department chairperson is required. (See the course descriptions for the independent study and project courses and for specific requirements.) The initiative for independent study courses in any area rests with the student.

Special Provisions "The requirement of a given course in any prescribed curriculum may be waived by the faculty of a student's college. The student's petition must be approved by his/her major adviser and the dean of the college. This power will usually be delegated by the faculty to the dean or to a committee." (Senate Rule 05.21(s): Waiver of Requirements in a Prescribed Curriculum)

This rule offers students the opportunity to develop a somewhat individualized plan of study with intellectual incentives and opportunities in addition to those in a regular curriculum.

In addition, upon the recommendation of the department chairperson, superior students may be allowed to count credits from up to two 800-level courses toward both a bachelor's degree and a master's degree, provided that the students have been admitted to the master's program.

Research Opportunities The talents and expertise of the faculty in all departments are reflected in the number of ongoing research projects. Undergraduates are included in many of these research projects, with the intent of discovering and fostering their creative talents. In funded research projects, students may have an opportunity to receive pay while learning.

Some flavor of the multiplicity of the research programs is reflected in special facilities, a few of which are: Analog Computer Facility, Antenna Systems Laboratory, Bioelectronics Laboratory, Computation Science Center, Electronics Laboratory, Engineering Design and Analysis Laboratory, Fluid Mechanics Laboratory, Materials Laboratories, Mechanics Research Laboratory, Sanitary Engineering Laboratory, Solid State Laboratory, Space Science Center, Wind Tunnel and Water Tunnel Facility, and X-ray Laboratory.

Students have the opportunity to acquire applied experience in business and industry by working with faculty members who undertake client-sponsored professional projects in management and technical areas for business and industry, and for state and local governments.

Preparing for Teaching Students interested in mathematics education (elementary or secondary), chemistry and physics teaching, earth science teaching, or general science teaching should refer to the Preparing for Teaching section that begins on page 23 and to the appropriate department description of the requirements.

Combined Programs of Study

In addition to pursuing a single major, students may combine programs of study as follows:

Minors: See page 18 for requirements. See also Interdisciplinary Minors, pages 25 and 53, and Departmental Programs of Study in this section.
Second Majors: See page 18.
Interdisciplinary Majors: Many of the departments in the college offer ways of combining a major with another field of interest. See the descriptions that follow.
Dual-Degree Programs: See page 17.
Student-Designed Majors: See page 82.
Other combined and interdisciplinary opportunities are described in "Special University Programs," pages 81–86.

Departmental Programs of Study

In addition to the following departmental majors and options, these departmental minors are offered:

Chemical engineering
Chemistry
Civil engineering
Electrical engineering
Engineering technology
Geology
Mathematics
Mechanical engineering
Physics

Chemical Engineering

(For descriptions of courses, see page 109.)

Chemical engineering is concerned with the analysis and design of processes that deal with the transfer and transformation of energy and material.

The practice of chemical engineering includes the conception, development, design, and application of physicochemical processes and their products; the economic development, design, construction, operation, control, and management of plants for these processes; and activities relating to public service, education, and research.

Traditional employment areas in the chemical process industries include industrial chemicals, petroleum and petrochemicals, plastics, pharmaceuticals, metals, textiles, and food. Chemical engineers are also working in increasing numbers in the emerging areas of energy engineering, pollution abatement, and biochemical and biomedical engineering; in addition, they are employed by many of the government laboratories and agencies as well as private industries and institutions.

The curriculum is designed to provide training for students to enter the diverse areas of employment or graduate study. The considerable number of electives in the curriculum provides flexibility for individuals to design programs that fulfill their needs and interests. They also provide an opportunity for students to elect departmental options or interdisciplinary minors in their programs.

A minimum of 129 credits is required for graduation with the degree of bachelor of science in chemical engineering. There are 10 electives in the chemical engineering curriculum. Seven of these are for the General Education Requirements. The remaining three electives should consist of two chemical engineering electives and one technical elective.

Students are required to obtain a minimum of 2.00 grade-point average in Chemical Engineering 501-502 and in overall standing at the end of the sophomore year in order to continue in the major.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Math 425-426	Calculus I and II	4	4
Phys 407	General Physics I	—	4
Chem 405	General Chemistry	4	—
Ch E 410	Survey of Current Energy and Pollution Control Technology	—	4
Electives (2)		4	4
		16	16
Sophomore Year			
Chem 683-684	Physical Chemistry I and II	3	3
Chem 685-686	Physical Chemistry Laboratory	2	2
Math 527	Differential Equations with Linear Algebra	4	—
C S 403	Introduction to Digital Computer Programming	2	—
Phys 408	General Physics II	4	—
Ch E 501-502	Introduction to Chemical Engineering I and II	3	3
Electives (2)		—	8
		18	16
Junior Year			
Chem 547-548	Organic Chemistry	3	3
Chem 549	Organic Chemistry Laboratory	2	—
Ch E 601	Fluid Mechanics and Unit Operations	3	—
Ch E 602	Heat Transfer and Unit Operations	—	3
Ch E 603	Applied Mathematics for Chemical Engineers	4	—
Ch E 604	Chemical Engineering Thermodynamics	—	4
Ch E 612	Chemical Engineering Laboratory I	—	2
Electives (2)		4	4
		16	16
Senior Year			
Ch E 605	Mass Transfer and Stagewise Operations	3	—
Ch E 606	Chemical Engineering Kinetics	3	—
Ch E 608	Chemical Engineering Design	—	3
Ch E 613	Chemical Engineering Laboratory II	2	—
Ch E 752	Process Dynamics and Control	—	4
Electives (4)		8	8
		16	15

Energy Option This option covers the major areas of current interest in the energy field. The required courses provide students with a general background knowledge of fossil fuels, nuclear power, solar energy, and other alternative energy resources. The elective courses will permit the student to study topics of special interest in more depth or gain a broader perspective on energy and some closely related subjects. Three courses are required, and a minimum of two additional courses of at least three credits each should be selected from the electives list. Students interested in the energy option should declare their intention during the sophomore year to the department faculty. They may consult with Stephen S. T. Fan.

Required Courses		
Ch E 705	Natural and Synthetic Fossil Fuels	4
Ch E 712	Introduction to Nuclear Engineering	4
M E 710	Solar Heating Systems	3
		11

Elective Courses		
Ch E 695	Chemical Engineering Project	3–4
Ch E 696	Independent Study	3–4
Ch E 772	Physicochemical Processes for Air and Water Quality Control	4
M E 605	Thermal System Analysis and Design	4
		6–8

Environmental Engineering Option The chemical engineering program, with its substantial requirement in chemistry, fluid dynamics, heat transfer, mass transfer, unit operations, and reaction kinetics, provides students with a unique preparation to deal with many aspects of environmental pollution problems. The option gives students a special focus on the application of chemical engineering principles and processes to the solution of problems relating to air pollution, water pollution, and the disposal of solid waste. Three required courses must be selected, plus two electives from the electives list. Each course must carry a minimum of three credits. Students interested in the environmental engineering option should declare their intention during the sophomore year to the department faculty. They may consult with Stephen S. T. Fan.

Required Courses		
Ch E 609	Fundamentals of Air Pollution and Its Control	4
Ch E 772	Physicochemical Processes for Water and Air Quality Control	4
Ci E 748	Solid Waste Management	3
		11

Elective Courses		
Ch E 695	Chemical Engineering Project	3–4
Ch E 696	Independent Study	3–4
Ci E 746	Wastewater Treatment Plant Design	3
Ci E 749	Water Chemistry	3
		6–8

Chemistry

(For descriptions of courses, see page 110.)

Students interested in chemistry may major in one of three programs offered in the department, depending upon their plans for a career. Since the required chemistry courses in each degree program are the same in the first year, it is easy to change from one program to another.

In each of the programs, students should register for the following courses in the first year: Chem 405 (first semester), General Chemistry; Chem 406 (second semester), Quantitative Analysis; Math 425 (first semester), Calculus I; and Math 426 (second semester), Calculus II. Students interested in a chemistry program may consult with the coordinator of undergraduate studies in the department.

Bachelor of Science in Chemistry

This curriculum is intended to prepare students for careers as professional chemists and to provide a strong foundation for graduate study in chemistry or in interdisciplinary areas of science calling for a strong background in chemistry. The curriculum requires a greater depth in chemistry and physics than do the other degree programs.

Requirements

1. Satisfy General Education Requirements.
2. Language requirement: Much of the chemical literature is in German or Russian and has not been translated. Students must demonstrate a proficiency in one of these languages by completing a year's course in that language. The choice is up to the individual.
3. For specific course requirements, see the accompanying chart.

Bachelor of Arts, Chemistry Major

This curriculum offers students the opportunity to combine a chemistry major with other interests. There are fewer required courses in chemistry and physics, and students have more opportunity to elect courses in other areas according to individual interests. The pre-healing arts students interested in chemistry, those preparing for secondary school teaching, or those interested in business can combine these interests with chemistry in this curriculum.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy the bachelor of arts degree requirements (see page 17).
3. For specific course requirements, see the accompanying chart.

Chemistry Baccalaureate Degree Requirements

Chemistry Courses	B.S.	B.A., Chemistry Major
405*	x	x
406 & 407, or 517 & 518	x	x
547 & 549, or 651 & 653	x	x
548 & 550, or 652 & 654	x	x
683 & 685	x	x
684 & 686	x	x
762 & 763	x	x
697	x	
698	x	
699	x	two other chemistry courses chosen from these, except 697 and 698, or two approved chemistry-related courses
755 & 756	x	
774 & 775	x	
776	x	
663		
708		
778		

Other Requirements
All majors: Math 425 and 426, Calculus I and II.

B.S. degree: Phys 407-408, General Physics I and II; Germ 401-402 or 403-404, or Russ 401-402; C S 403 or 410, Introduction to Computer Programming; two chemistry-related courses (only one of which may be a chemistry course).†

B.A. degree, chemistry major: Phys 407, General Physics I, or Phys 401-402, Introduction to Physics I and II.

*Chem 403-404 may be substituted for Chem 405, but this is not recommended.
†Suggested courses: Math 527 or 528; Phys 505; E E 620.

Bachelor of Arts, Chemistry and Physics Teaching

This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are more opportunities to teach both subjects on the secondary-school level. Chemistry and physics teaching majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Requirements
1. Satisfy General Education Requirements.
2. Satisfy the bachelor of arts degree requirements (see page 17).
3. Chemistry requirements: 405, General Chemistry or 403-404, General Chemistry; 406, 407, Quantitative Analysis; 545, 546 or 547-548 and 549-550, Organic Chemistry; 683-684 and 685-686, Physical Chemistry I and II.
4. Physics requirements: 407, General Physics I; 408, General Physics II; 505, General Physics III; 605, Experimental Physics I. Physics 406, Introduction to Modern Astronomy, is strongly recommended.
5. Math requirements: 425, Calculus I, and 426, Calculus II.
6. All education courses in the teacher preparation program (see pages 23–25).

General Science Certification Students majoring in chemistry and/or physics may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Civil Engineering

(For descriptions of courses, see page 112.)

Civil engineers are concerned with planning, design, and construction of public and private facilities, which must not only provide safe, efficient service to the users but must, in addition, be compatible with the environment (both natural and human) in which they are placed.

The program leads to a bachelor of science degree in civil engineering. The strong analytical basis of the program prepares graduates for many career opportunities. They may enter professional practice or pursue further study in graduate school. Undergraduates study the basic sciences and mathematics, as well as engineering science, analysis, and design.

Freshman Year		Fall	Spring
Ci E 400	Ci E Lectures	0	—
Ci E 505	Surveying	—	4
Math 425, 426	Calculus I, II	4	4
Chem 403, 404	General Chemistry	4	4
Engl 401	Freshman English	4	—
Phys 407	General Physics I	—	4
Elective (1)	General Education Requirement	4	—
		16	16
Sophomore Year			
Ci E 525, 526	Mechanics I, II	3	3
Ci E 527	Mechanics III	—	3
Phys 408	General Physics II	4	—
Math 527	Differential Equations with Linear Algebra	4	—
Math 528, 644, or 645		—	4
C S 410 and C S 410F	Introduction to Computer Programming	4	—
Ci E 530	Introduction to Civil Engineering Computer Applications	—	3
Electives (2)	General Education Requirements	4	4
		19	17
Junior Year			
Ci E 622	Engineering Materials	4	—
Ci E 642	Fluid Mechanics	4	—
Ci E 643	Engineering Aspects of Environmental Pollution Control	3	—
Ci E 681	Structural Analysis	3	—
Ci E 644	Water and Wastewater Engineering	—	3
Ci E 665	Soil Mechanics	—	4
Ci E Elective (1)*		—	3
Electives (2)	General Education Requirements	4	4
Elective (1)	Approved technical elective	—	3
		18	17

Senior Year			
Ci E 682	Project Planning and Design	—	4
Ci E 733	Systems Analysis	3	—
Electives (2)	General Education Requirements	4	4
Ci E Electives (5)*		9	6
		16	14

*Minimum of two approved design courses is required, one of which must be Ci E 774 or Ci E 793.

The electives will be chosen to meet requirements of the University, the department, and any option selected.

To enter required 600-level Ci E courses, a Ci E major must have a 2.00 cumulative grade-point average and must have completed the Ci E 525, 526, 527 sequence with a 2.00 grade-point average. Exceptions to these requirements will be granted only under extremely unusual circumstances and will require approval of a petition by the student's adviser and department chairperson.

A minimum of 133 total credits is required for graduation. To qualify for graduation, the student must have a 2.00 average in all Ci E courses.

Constructed Systems Option All structures, regardless of purpose, must be planned, designed, and built to resist the natural forces (gravity, wind, earthquake) and those imposed by people during construction and use of the structure.

Two courses (7 credits) are required. A minimum of 5 additional courses (15 credits) must be elected from the following list, of which 4 courses (12 credits) must be in civil engineering. Courses not on the list may be elected upon approval of the student's adviser.

The option is selected at the beginning of second semester in the junior year and must meet all the previously listed graduation requirements. Interested students may consult with the option adviser.

Required Courses (2)		
Ci E 685	Indeterminate Structures	3
Ci E 774	Reinforced Concrete Design I	4
or Ci E 793	Structural Design in Steel	4

Elective Courses (5)

Minimum of 12 credits from the following:

Ci E 763	Advanced Soil Mechanics I	3
Ci E 765	Foundation Engineering	3
Ci E 766	Geological Engineering	3
Ci E 774	Reinforced Concrete Design I	4
Ci E 782	Timber Design	3
Ci E 784	Structural Analysis by Matrix and Numerical Method	3
Ci E 785	Introduction to Structural Vibrations	3
Ci E 786	Finite Element Applications for Solid Mechanics	3
Ci E 791	Prestressed Concrete	3
Ci E 793	Structural Design in Steel	4
Ci E 794	Reinforced Concrete Design II	3

Minimum of 3 credits approved technical elective:

Arts 455	Introduction to Architecture	4
E E 541	Electrical Circuits	4
ESci 401 or 402	Principles of Geology I or II	4
Math or C S	(any 600 course or above)	4
M E 441	Engineering Graphics	4
M E 503	Thermodynamics	4
M E 727	Advanced Mechanics of Solids (Minimum of 22 credits)	4

Environmental Engineering Option Environmental engineering is the application of engineering principles and practices to one or more elements of the environment to protect or improve the quality of life. Environmental engineers use specialized engineering knowledge to manage water, air, and land resources systematically. This option provides fundamental environmental engineering concepts and methods of design and allows specialization in an area of the student's choice.

Five courses (17 credits) are required. At least 6 additional credits must be selected from the following list of elective courses, of which a minimum of 3 credits must be in civil engineering. Courses not on the list may be elected upon approval of the student's adviser.

The option is selected at the beginning of second semester in the junior year and the student must meet all the previously listed graduation requirements. Interested students may consult with the option adviser, Paul L. Bishop.

Required Courses (5)		
Ci E 756	Wastewater Microbiology	4
Ci E 743	Environmental Sampling and Analysis	3
Ci E 746	Wastewater Treatment Plant Design	3
Ci E 749	Water Chemistry	3
Ci E 774	Reinforced Concrete Design I or	4
or Ci E 793	Structural Design in Steel	4
		17

Elective Courses (2)

Minimum of 3 credits from the following:

Ci E 734	Optimization of Engineering Systems	3
Ci E 740	Rural Wastewater Engineering	3
Ci E 741	Open Channel Flow	3
Ci E 742	Hazardous Waste Management	3
Ci E 744	Environmental Limnology	4
Ci E 745	Engineering Hydrology	3
Ci E 747	Introduction to Marine Pollution and Control	3
Ci E 748	Solid Waste Management	3
Ci E 755	Design of Water Transmission Systems	3

Minimum of 3 credits approved technical elective:

Chem 545	Organic Chemistry	3
Chem 546	Lab (concurrently with Chem 545)	2
Chem 683	Physical Chemistry I	3
Ch E 604	Chemical Engineering Thermodynamics	4

Ch E 609	Fundamentals of Air Pollution and Its Control	4
E E 541	Electrical Circuits	4
ESci 401 or 409	Principles of Geology I or Environmental Geology	4
ESci 710	Groundwater Hydrology	4
M E 441	Engineering Graphics	4
M E 503	Thermodynamics	4
	(Minimum of 23 credits)	

Computer Science

(For descriptions of courses, see page 115.)

Computer scientists are concerned with all aspects of the design, implementation, and application of computers. They are concerned with problem solving in general, with particular emphasis on the design of computer-efficient solutions. This involves detailed understanding of the nature of algorithms, the software implementation techniques necessary to utilize these algorithms on computers, and a knowledge of how algorithms can be combined in a structured manner to form highly complex software systems.

The program leads to a B.S. in computer science and is designed to prepare students for employment in the computer field or to pursue graduate study in computer science. The program emphasizes the application of computer science theory and principles but also includes a broad background in basic mathematics and an introduction to computer hardware. Most courses require heavy use of the computer, and the laboratories stress hands-on experience with computer equipment.

Demand for the B.S. in computer science far exceeds the department's resources. Therefore, enrollment in the B.S. in computer science program is limited. Transfer into this program is on a space-available basis only and cannot be guaranteed. Selection is based on overall grade-point average and achievement in computer science courses. In addition, many computer science courses are not normally open to nonmajors.

Computer science majors must obtain a grade of C− or better in all C S courses below 695 and an overall grade-point average of 2.00 or better in all computer science courses as a requirement for graduation. If at the end of any semester, including the first, a student's cumulative average in C S courses falls below 2.00, the student may not be allowed to continue as a C S major.

Requirements

1. Eleven full-credit courses chosen from the General Education Requirements as required by the University. Phil 550 (Logic) is strongly recommended.

2. Seventeen full-credit courses chosen as follows:

Six required computer science courses: C S 410, 410F, 410P—Introduction to Computer Programming; C S 610, Operating System Fundamentals; C S 611, Assembler-Language Programming; C S 612, Data Structures and Algorithms; C S 671, Programming Language Concepts and Features; and C S 753, Numerical Methods and Computers I.

Five required mathematics courses: Math 425, Calculus I; Math 426, Calculus II; Math 531, Mathematical Proof (Sec. C, Discrete Mathematics Structures); Math 644, Probability and Statistics for Applications (or 735/6); and Math 645, Applied Linear Algebra (or 761/2).

Two required E E courses: E E 543, Introduction to Digital Systems and E E 612, Logical Design of Digital Computers.

Four approved computer science electives chosen from C S courses numbered 696 and above and either E E 711 or E E 714.

Earth Sciences

(For descriptions of courses, see page 120.)

The courses offered in the Department of Earth Sciences cover the broad spectrum of geology, hydrology, and oceanography. They encompass a group of related studies concerned with an understanding of the size, shape, and constitution of the earth; the processes that are now, or have formerly been, at work upon its surface, in its oceans, and within its interior; its origin; and evolution of life upon it.

The need for people trained in the earth sciences has been emphasized by the search for new and additional energy and mineral resources, by the increased concern with intelligent management of the environment, by the need to develop and manage fresh water resources, and by expansion of research in both oceanography and extraterrestrial geology. In addition, the demand for well-trained secondary teachers of earth sciences has steadily increased over the past few years.

Three undergraduate degree programs are offered through the Department of Earth Sciences. Students interested in an earth sciences program may consult with the department chairperson, Herbert Tischler.

Bachelor of Science in Geology

This program represents the strongest concentration in the earth and cognate sciences and is especially well suited for students who plan to continue their studies in graduate school. Beyond a central core of courses, there is sufficient flexibility in course selection so that students may, in consultation with their academic advisers, orient the program toward a particular facet of the earth sciences (e.g., mineralogy-petrology, oceanography, hydrology, geophysics-structural geology, geomorphology-glacial geology, geochemistry, paleontology-stratigraphy, etc.).

Requirements

1. Satisfy the General Education Requirements.

2. Satisfactorily complete Math 425 and 426, Chem 403-404, and Phys 407-408 and 505. Some of these courses may also satisfy group 2 and part of group 3 of the General Education Requirements.

3. Complete a minimum of 12 courses in earth sciences, which should include: ESci 401, Principles of Geology I or ESci 409, Environmental Geology; ESci 402, Principles of Geology II; ESci 501, Introduction to Oceanography; ESci 512-513, Principles

of Mineralogy I-II; ESci 531, Structural Geology; ESci 561, Geomorphology; ESci 614, Petrography; ESci 652, Paleontology and Biostratigraphy; and three approved earth sciences 700-level electives.

4. Complete four approved electives. The following should be considered: one additional 700-level course in the earth sciences, additional courses in mathematics, chemistry, and physics; as well as courses in computer science, engineering, and the biological sciences.

Bachelor of Arts, Geology Major

This program offers students an opportunity to obtain a broad liberal education and a general background in geology with a greater degree of freedom in choosing electives than in the bachelor of science program. By a careful choice of electives, students can prepare for graduate school, business, or industry.

Requirements

1. Satisfy the General Education Requirements.
2. Satisfy the bachelor of arts degree requirements (page 17).
3. Complete a minimum of eight courses in the department with a C− (1.67) or better, which should include: ESci 401, Principles of Geology I or ESci 409, Environmental Geology; ESci 402, Principles of Geology II; ESci 512, Principles of Mineralogy; and five upper-level earth sciences courses, two of which must be chosen from courses numbered 700 or above.
4. Math requirements: 425, Calculus I, and 426, Calculus II.

It is strongly advised that students complete, as early as possible, a year each of college chemistry and physics.

Bachelor of Arts, Earth Science Teaching Major

This program is specifically designed to prepare students to teach earth sciences in secondary school. Upon graduation from this program, students receive full teacher certification that is recognized in most states.

Requirements

1. Satisfy the General Education Requirements.
2. Satisfy the bachelor of arts degree requirements (page 17).
3. Complete: ESci 401, Principles of Geology I or ESci 409, Environmental Geology; ESci 402, Principles of Geology II; ESci 501, Introduction to Oceanography; Geog 473, The Weather; Chem 403-404, General Chemistry; Phys 401-402, Introduction to Physics I and II; Phys 406, Introduction to Modern Astronomy; plus 12 approved elective credits from intermediate and/or advanced earth sciences courses.
4. Math requirements: 425, Calculus I, and 426, Calculus II.
5. Satisfy the secondary-school teacher education program. (See "Preparing for Teaching," pages 23–25.)

General Science Certification Students majoring in any of the three earth sciences undergraduate programs may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Electrical and Computer Engineering

(For descriptions of courses, see page 127.)

Electrical and computer engineers design systems for investigating the ocean, for monitoring medical procedures, and for processing information from outer space. They develop electronic instrumentation for environmental protection, design mini- and microcomputers for industry, and use their knowledge to help solve such major problems of society as transportation, pollution, and health care delivery.

At UNH, the keynote of the electrical and computer engineering program is the involvement of students in the solution of real-world problems. During the freshman and sophomore years, students take basic courses in mathematics and physics, learn how to use the computer, and receive introductory experience in electric circuits, logic design, and electronics.

The electrical and computer engineering curriculum prepares students for graduate work in electrical engineering, for productive employment as electrical engineers, and for graduate work in related areas such as business administration. It is compatible with the dual-degree program described on page 17.

In order for an electrical engineering major to enter the junior year and take any of the following first-term junior courses: E E 617, E E 645, E E 651, or E E 612, he or she must have a 2.10 grade-point average in all of the following freshman and sophomore courses: Math 425, 426, 527; Physics 407, 408; and E E 541, 543, 544, and 548. A student who has not met this requirement has three choices of action: 1) petition to the department's Undergraduate Committee for a waiver of the requirement based on extenuating circumstances; 2) a change of major; or 3) repeat certain of the nine freshman or sophomore courses until the grade-point average in the nine courses reaches 2.10.

Any electrical engineering major whose cumulative grade-point average in E E courses is less than 2.00 during any three semesters will not be allowed to continue as an electrical engineering major. Electrical engineering majors must obtain a 2.00 grade-point average in E E courses as a requirement for graduation.

Basic Curriculum for Bachelor of Science in Electrical Engineering

Students, with their advisers' assistance, should plan their programs based on the following distribution of courses for a total of 129 credits. Students

who have not had a year of high school chemistry with a grade of B− or better are required to take Chem 403 sometime during their college program.

First Two Years Are Common to All Options

Freshman Year		Fall	Spring
Core Courses			
Math 425, 426	Calculus I and II	4	4
Phys 407, 408	General Physics I and II	4	4
Elective	Writing Skills	4	—
C S 410	Introduction to Computer Programming	—	4
Electives (2)	General Education Requirements	4	4
	Total	16	16

Sophomore Year			
Core Courses			
Math 527	Differential Equations with Linear Algebra	4	—
E E 541	Electrical Circuits	4	—
E E 543	Introduction to Digital Systems	4	—
E E 544	Engineering Analysis	—	3
E E 548	Circuits and Electronics	—	4
M E 523	Introduction to Statics and Dynamics	—	3
Elective	Math-Science elective*	—	4
Electives (2)	General Education Requirements	4	4
	Total	16	18

Junior Year			
Core Courses			
E E 617, 618	Junior Laboratory I and II	2	2
E E 612	Computer Organization	4	—
E E 645	Electrical Networks	3	—
E E 651	Advanced Electronics I	3	—
E E 603	Electromagnetic Fields and Waves I	—	3
E E 646	Probability and Discrete Systems	—	3
Elective	Math-Science elective*	—	4
Elective	General Education Requirement	4	—
	Subtotal	16	12
Computer Engineering Option			
C S 610	Operating System Fundamentals	—	4
	Total	16	16
Electrical Engineering Systems Option			
E E 652	Advanced Electronics II	—	4
	Total	16	16

Senior Year			
Core Courses			
E E 656	Electromechanical Devices	3	—
Elective	Free elective	—	4
Electives (2)	General Education Requirements	4	4
	Subtotal	7	8
Computer Engineering Option			
E E 711	Digital Systems	4	—
E E 714	Minicomputer Applications Engineering	—	4
E E 757 or 782	Communication or Control Systems	4	or 4
Elective	Approved professional elective	4	or 4
	Total	15	16
Electrical Engineering Systems Option			
E E 757	Fundamentals of Communication Systems	4	—
E E 782	Control Systems	—	4
Electives (2)	Approved professional electives	4	4
	Total	15	16

*Math-Science electives are courses chosen from the following list: Math 645, 646, 647; M E 503, 508; Physics 505.

Options and Minors

In the junior year, students complete the core courses and begin studying in a chosen option. Students must choose one of the three options and additionally may elect one of the various minors (see pages 53–55 for descriptions of minors). The options, which are described in the following paragraphs, provide for professional electives so that individual student interests may be pursued. In addition, the senior year features many opportunities for individual or group projects. Each option is made up of five courses.

Computer Engineering Option During the past several years, advances in the technology of electronic circuit manufacture have vastly reduced the costs of digital computers. This low cost, coupled with flexibility, has allowed them to be used in a broad variety of applications, from data processing in a small retail store to controlling a machine tool in a manufacturing plant. Since computers are basically electronic devices, it is primarily the job of electrical engineers to design or specify the purchase of the computer and integrate it into larger systems. To do so requires a knowledge of both hardware (circuits) and software (programming) concepts. In this option, students will learn to design, build, and test systems involving digital computers.

Required Courses: E E 711, E E 714, C S 610.

Elective Courses: E E 757 or E E 782; and one approved professional elective chosen in consultation with the adviser to meet students' professional objectives.

Electrical Engineering Systems Option The electrical engineering systems option provides students with the fundamentals of communication, control, and computer systems. An effort is made to balance both the theory and the applications so that students will appreciate both system development and system implementation. In addition to the three required courses, there are two additional professional elective courses that allow students to delve further into areas of interest.

Required Courses: E E 652, E E 757, and E E 782.

Elective Courses: Two courses chosen in consultation with the adviser to satisfy students' and programmatic goals.

Student-Designed Option This option is for the unusual student whose grade-point average is at least 2.70 and who has well-defined academic goals that cannot be satisfied by either of the regular options. The student and adviser will prepare an option proposal that will include a statement of the student's goals and a listing of the option courses that will be taken. Each student's proposal will require approval by the department's Undergraduate Committee.

Engineering Technology

(For descriptions of courses, see page 130.)

Engineering technology requires the application of engineering and scientific knowledge and methods combined with technical skills in support of engineering activities. Normally engineering technology is not concerned with the development of new principles and methods. The engineering technology program offers only junior- and senior-level work. Students admitted to this program must have an appropriate associate degree from the New Hampshire Technical Institute, the Vermont Technical College, Keene State College, or an equivalent A.B.E.T.-accredited school.

Curricula in electrical engineering technology and mechanical engineering technology are offered. Students may continue study in their fields of specialization, select electives that broaden their educational backgrounds, and participate in project courses where, as part of a technology team, their talents are applied in solving real problems.

Students interested in an engineering technology program may consult with the program chairman, T. A. Parssinen.

Electrical Engineering Technology

Junior Year		Fall	Spring
ET 671	Digital Systems	—	4
ET 677	Analog Systems	4	—
ET 637	Heat and Fluid Power I	4	—
ET 674	Control Systems and Components	4	—
ET 680	Communications and Fields	—	4
C S 410	Introduction to Computer Programming	—	4
Electives (2)		4	4
		16	16
Senior Year			
ET 691	Electrical Engineering Technology Project	4	4
ET 633	Industrial Organization and Law	4	—
ET 634	Economics of Business Activities	—	4
ET 690	Microcomputer Technology	4	—
Electives (3)		4	8
		16	16

All students entering the electrical engineering technology program should have a minimum of 12 semester hours of college-level mathematics, including 2 semesters of calculus. Students without this background will be required to take either Math 426 or Math 527 during the first semester of their junior year. The student's adviser will determine which of these courses is most appropriate for the student's program.

Mechanical Engineering Technology

Junior Year		Fall	Spring
ET 637 and 638	Heat and Fluid Power I and II	4	4
ET 641	Production Systems	4	—
ET 675	Electrical Technology	4	—
ET 644	MET Concepts in Design and Analysis	—	4
C S 410	Introduction to Computer Programming	—	4
Electives (2)		4	4
		16	16
Senior Year			
ET 651	Mechanical Engineering Technology Project	4	4
ET 633	Industrial Organization and Law	4	—
ET 634	Economics of Business Activities	—	4
ET 645	Instrumentation	4	—
Electives (3)		4	8
		16	16

All students entering the mechanical engineering technology program should have a minimum of 12 semester hours of college-level mathematics, including 2 semesters of calculus. Students without this background will be required to take either Math 426 or Math 527 during the first semester of their junior year. The student's adviser will determine which of these courses is most appropriate for the student's program.

All mechanical engineering technology students must satisfactorily complete Chem 403 or offer evidence of equivalent coursework.

Mathematics

(For descriptions of courses, see page 156.)

Five undergraduate programs are offered through the Department of Mathematics. Normally, students will enter one of these specific programs; generally, however, they may change programs within the department at any time. Enrollment in the interdisciplinary B.S. options is limited, and transfer into these programs cannot be guaranteed. Students who take C S 410 and Math 425 and 426 in the freshman year are on schedule in any of the five programs in the department.

In the sophomore year, Math 527, 528, and 531 will keep a student on schedule in the B.A. program. In three of the four B.S. programs, these three courses plus one other (depending on the program) constitute the recommended sophomore sequence. The B.S. in mathematics education (elementary option) has a completely different sophomore sequence. Thus, a student can maintain reasonable flexibility for program change within the department for two years.

In some programs, there are courses outside the department that should be completed in the sophomore year. These are noted in the detailed lists of requirements that follow.

Computer science courses play a special role in mathematics major programs. C S 410 is required in all mathematics programs, and some mathematics electives may be replaced by C S electives (see specific program requirements below).

In addition to the degree programs, the department has an active interest in the actuarial profession and is an examination center for the Society of Actuaries. Recommended courses for those interested in actuarial science can be adapted to either a bachelor of science or a bachelor of arts program.

Bachelor of Science in Mathematics

This program represents the strongest concentration in mathematics of any program offered by the department. Included among the required courses are those usually required for admission to graduate work in mathematics. Through a judicious choice of electives, students may construct a stronger pregraduate program, or they may slant the program toward a career in business or industry.

Requirements

1. General Education Requirements as required by the University. (Math 425 should be used to satisfy the requirement in quantitative reasoning, group 2.)
2. Thirteen full credit courses in mathematics chosen as follows—

Eleven required courses: Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Mathematical Proof; Math 644, Probability and Statistics for Applications (or 735-736); Math 761, Abstract Algebra; Math 762, Linear Algebra; Math 767, One-Dimensional Real Analysis; Math 784, Topology; and Math 788, Complex Analysis.

One approved mathematics elective chosen from (a) below, and one approved mathematics and/or computer science elective chosen from either (a) or (b):

a) Mathematics courses numbered 646 or above, excluding 703 and 791.
b) Computer science courses numbered 610 or above.

3. Other required courses: 5 courses chosen as follows:
   a) Computer Science 410
   b) Languages (two semesters at the 400 level or one semester at the 500 level of French, Russian, or German; 503 satisfies General Education, group 5, Foreign Culture)
   c) Physics 407-408 (satisfies two of the three courses for General Education, group 3, Physical Science)
4. Six free electives.

Bachelor of Arts, Mathematics Major

This program offers a broader liberal education than do any of the bachelor of science programs. By a careful choice of electives, however, students can shape this major into a preparation for graduate school, business, or industry.

Requirements

1. General Education Requirements as required by the University. (Math 425 should be used to satisfy the requirement in quantitative reasoning, group 2.)
2. Eleven full credit courses in mathematics and/or computer science chosen as follows—

Nine required courses: Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Mathematical Proof; Math 644, Probability and Statistics for Application (or 735-736); Math 761, Abstract Algebra; Math 762, Linear Algebra; and Math 767, One-Dimensional Real Analysis.

Two approved mathematics and/or computer science electives chosen from computer science courses numbered 610 or above and mathematics courses numbered 646 or above, excluding 703 and 791.

3. Other required courses: 3 courses chosen as follows:
   a) Computer Science 410
   b) Languages (two semesters at the 400 level or one semester at the 500 level; 503 satisfies General Education, group 5, Foreign Culture)
4. Eight free electives.

Bachelor of Science in Mathematics Education

This is a professional degree program to prepare students for mathematics teaching at the elementary or secondary level. The program is coordinated with the education department's teacher certification programs. Students may complete the degree requirements with full teacher certification in either four or five years. Students electing the four-year option must plan for one semester of student teaching (Educ 694) in their senior year, and should consult with the mathematics department program adviser concerning the schedule of mathematics courses. The five-year program involves a required year-long teaching internship in the fifth year. (The internship can be coupled with other graduate work leading to a master's degree.) See "Preparing for Teaching," page 23.

Elementary Option

Requirements

1. General Education Requirements as required by the University. (Math 425 should be used to satisfy the requirement in quantitative reasoning, group 2.)
2. Fourteen full credit courses in mathematics, mathematics education, and computer science chosen as follows—

Thirteen required courses: C S 410, Introduction to Computer Programming; Math 419, Evolution of Mathematics; Math 425, Calculus I; Math 426, Calculus II; Math 531, Mathematical Proof; Math 536, Introductory Statistical Inference; Math 621, Number Systems for Elementary School Teachers;

Math 622, Geometry for Elementary School Teachers; Math 623, Topics for Elementary School Teachers; Math 645, Applied Linear Algebra; Math 657, Geometry; Math 703, Mathematics Education, K–6; and Math 791, Mathematics Education.

One additional approved mathematics or computer science elective, usually taken from: Math 651, Combinatorics; Math 656, Introduction to Number Theory; Math 658, Topics in Geometry; Math 698, Senior Seminar; C S 610, Operating System Fundamentals; C S 611, Assembler-Language Programming; and C S 612, Data Structures and Processes.

3. Other required courses: 6 courses chosen as follows:
   a) Physics 406 (satisfies Physical Science requirement)
   b) Education 500, 700, 701, 705, and 706
4. Three free electives.

Secondary Option

Requirements

1. General Education Requirements as required by the University. (Math 425 should be used to satisfy the requirement in quantitative reasoning, group 2.)

2. Fourteen full credit courses in mathematics, mathematics education, and computer science chosen as follows—

Twelve required courses: C S 410, Introduction to Computer Programming; Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Mathematical Proof; Math 644, Probability and Statistics for Applications (or 735-736); Math 645, Applied Linear Algebra (or 762); Math 657, Geometry; Math 698, Senior Seminar; Math 761, Abstract Algebra; and Math 791, Mathematics Education.

Two additional approved mathematics or computer science electives, usually taken from: Math 651, Combinatorics; Math 656, Introduction to Number Theory; Math 658, Topics in Geometry; Math 767, One-Dimensional Real Analysis; Math 784, Topology; C S 610, Operating System Fundamentals; C S 611, Assembler-Language Programming; C S 612, Data Structures and Processes.

3. Other required courses: 4 courses chosen as follows:

Education 500, 700, 701, 705.

4. Four free electives.

Bachelor of Science Interdisciplinary Programs in Mathematics and Its Applications

These programs are designed to prepare students for employment in various areas of applied mathematics. Certain of them also lead to graduate work in appropriate fields (e.g., physics, computer science, economics). In this program, the major may consist of mathematics combined with any one of the following disciplines: chemistry, computer science, economics, electrical science, fluid dynamics, mechanics, physics, statistics, and thermodynamics.

Each interdisciplinary major consists of ten mathematics courses plus five courses in the other discipline. Specific requirements follow. If more than five courses outside of mathematics are required or elected, the excess may be used to satisfy appropriate General Education Requirements.

Requirements

1. General Education Courses as required by the University. (Math 425 should be used to satisfy the requirement in quantitative reasoning, group 2.)

2. Ten mathematics courses chosen as follows—

Six required core courses: Math 425, Calculus I; Math 426, Calculus II; Math 527, Differential Equations with Linear Algebra; Math 528, Multidimensional Calculus; Math 531, Mathematical Proof (in the Math-C S Option this must be Math 531C, Discrete Mathematics Structures); Math 645, Applied Linear Algebra (or 761-762).

Four additional mathematics courses (note: mathematics electives must be chosen from mathematics courses numbered 646 or above, excluding 703, 791); in the Math-Statistics Option this may include C S courses numbered 503 or above):

In the Math-C S Option: Math 644, Probability and Statistics for Applications (or 735 and 736) and three approved math electives.

In the Math-Econ Option: Math 735, Probability; Math 736, Statistics; and two approved math electives.

In all options except statistics: Math 644, Probability and Statistics for Applications (or 735 and 736); Math 646, Analysis for Applications; Math 647, Complex Analysis for Applications; and one approved math elective.

3. One required course in all options—

Computer Science 410

4. Six additional courses as follows—

Mathematics-Chemistry Option: Chem 405, General Chemistry (taken no later than sophomore year); Chem 683 and 685, Physical Chemistry I, and Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem 684 and 686, Physical Chemistry II, and Physical Chemistry Laboratory (these two courses regarded as a single unit); Chem 776, Physical Chemistry III; either Phys 701, Introduction to Quantum Mechanics I, or Chem 774, Inorganic Chemistry; and one free elective (note: Chem 547-548, Organic Chemistry, suggested as elective for those planning to do graduate work in chemical physics).

Mathematics-Computer Science Option: C S 610, Operating System Fundamentals; C S 611, Assembler-Language Programming; C S 612, Data Structures and Processes; two more approved computer science courses, chosen from C S courses numbered 671 or above; other required courses: two courses chosen as follows: E E 531, Elements of Digital Logic; E E 612, Logical Design of Digital Computers; and one free elective.

Mathematics-Economics Option: Econ 401, Principles of Economics (Macro); Econ 402, Principles of Economics (Micro); Econ 605, Intermediate Microeconomic Analysis; Econ 611, Intermediate Macroeconomic Analysis; two approved economics courses (chosen from the following:

Econ 626, Introduction to Quantitative Economics; Econ 727, Advanced Econometrics; Econ 737, Decision Theory and Bayesian Methods; Admn 605, Operations Research; Admn 606, Advanced Operations Research).

Mathematics-Electrical Science Option: E E 541, Electrical Circuits; E E 548, Circuits and Electronics; E E 645, Electrical Networks; E E 603, Electromagnetic Fields and Waves I; E E 757, Fundamentals of Communication Systems; E E 782, Control Systems. (Note: E E 541 and 548 should be taken no later than the sophomore year.)

Mathematics-Fluid Dynamics Option: M E 503, Thermodynamics; M E 508, Fluid Dynamics; M E 525, Mechanics I; M E 707, Analytical Fluid Dynamics; M E 708, Gas Dynamics; and one free elective.

Mathematics-Mechanics Option: M E 503, Thermodynamics; M E 525, Mechanics I; M E 526, Mechanics II; M E 527, Mechanics III; and two of the following three courses: M E 723, Advanced Dynamics; M E 724, Vibration Theory and Applications; M E 727, Advanced Mechanics of Solids.

Mathematics-Physics Option: Phys 407, General Physics I; Phys 408, General Physics II; Phys 505, General Physics III; either Phys 701-702, Introduction to Quantum Mechanics I and II, or Phys 703-704, Electricity and Magnetism I and II; and one free elective. (Note: Phys 407-408 should be taken no later than the sophomore year.)

Mathematics-Statistics Option: either Math 767, One-Dimensional Real Analysis or 753, Numerical Methods and Computers I; five statistics courses: 735, Probability and 736, Statistics required; three approved electives chosen from: 737, Decision Theory and Bayesian Methods; 738, Multivariate Statistical Analysis; 739, Linear Statistical Models; 740, Nonparametric Statistical Methods; and 742, Statistics Internship.

Mathematics-Thermodynamics Option: M E 503, Thermodynamics; M E 508, Fluid Dynamics; M E 525, Mechanics I; two of the following three courses—M E 701, Macroscopic Thermodynamics, M E 702, Statistical Thermodynamics, M E 603, Heat Transfer; and one free elective.

Mechanical Engineering

(For descriptions of courses, see page 159.)

Mechanical engineering is a challenging profession encompassing research, design, development, and production of aerospace vehicles, underwater vessels, instrumentation and control systems, nuclear and conventional power plants, and consumer and industrial products in general. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The program in mechanical engineering is designed to develop the student's creative potential to meet the increasingly complex needs of industry, government, and education while giving an appreciation of the role of technology in a modern society.

The curriculum prepares prospective graduates either for more advanced studies or for beginning professional engineering careers. It provides a foundation of knowledge in the basic physical sciences, mechanics of solids and fluids, dynamic systems, thermal sciences, materials science, and design. Students develop abilities in analysis, experimentation, and design. Elective courses allow students to gain additional competence in any of these specific areas. Other elective courses in the arts, humanities, and the social sciences are included to provide a liberal education.

Students, with their advisers' assistance, should plan a program based on the following distribution of courses that averages 16 credits per semester and totals not less than 128 credits. The outline that follows is to be considered as being typical only in format. Within the constraints of satisfying all of the requirements and having all the necessary prerequisites, schedules may vary because of scheduling needs or student preference. Some mechanical engineering elective courses may not be offered every year.

The curriculum has nine elective courses. These should be selected in consultation with a departmental adviser to lead to a balanced program that addresses a chosen area of interest. Six of the elective courses are to satisfy the University's General Education Requirements. Three technical elective courses of at least 3 credits each are required. Some programs may require additional elective courses to reach the minimum of 128 credits required for graduation. Other programs may exceed 128 credits to include all the required courses.

To enter the junior-year courses in the mechanical engineering major, students must have a 2.00 grade-point average or higher in the following courses: Phys 407, Phys 408, M E 503, M E 525, and M E 526.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Chem 405*	General Chemistry	—	4†
Math 425-426	Calculus I and II	4	4
Phys 407-408	General Physics I and II	4	4
M E 441	Engineering Graphics	4†	—
M E 525	Mechanics I	—	3
		16	15
Sophomore Year			
Math 527	Differential Equations with Linear Algebra	4	—
Math 528	Multidimensional Calculus	—	4
M E 526,527	Mechanics II and III	3	3
M E 561	Introduction to Materials Science	3	—
M E 564	Materials II	—	3‡
M E 503	Thermodynamics	—	3
M E 545	Materials Laboratory	1†	—

M E 546	Mechanics Laboratory	—	1†
C S 410	Introductory Programming	2	—
C S 410F	Scientific Programming with FORTRAN	2	—
Elective		—	3-4
		15	17-18
Junior Year			
M E 508	Fluid Dynamics	3	—
M E 547	Thermal Science Laboratory	2	—
M E 603	Heat Transfer	—	3
M E 629	Kinematics and Dynamics of Machines	3‡	—
M E 643	Elements of Design	—	3‡
M E 648	Systems Modeling and Experimentation I	—	3
E E 535	Circuits and Signals	4	—
E E 536	Electronics and Electromagnetics	—	4
Electives (2)		3-4	3-4
		15-16	16-17
Senior Year			
M E 605	Thermal System Analysis and Design	3‡	—
M E 655	Design Process	2	—
M E 696	Mechanical Engineering Projects	3	—
M E 749	Systems Modeling and Experimentation II	3	—
Electives (6)		6-8	12-16
		17-19	12-16

*Chem 403-404 may be required for students whose preparation in chemistry is inadequate.
†May be required in alternate semester to facilitate scheduling.
‡Recommended elective for those who entered 1983 or before; required thereafter.

Energy Option Many mechanical engineering graduates traditionally pursue professional careers in areas that are related to energy generation, conversion, or use. Increased emphasis on energy conservation and the development of alternate energy sources has created challenging and rewarding opportunities for graduates having a strong interest and capability in these fields. The Department of Mechanical Engineering offers a formal energy option intended to promote the development of well-planned student programs with special emphasis on courses applicable to career goals in energy-related industries. This program of five courses, open to mechanical engineering majors, emphasizes those subjects necessary for an understanding of the engineering aspects of energy systems and related problem areas. Students electing the energy option should do so during the first semester of the junior year and have their program approved by a department faculty member involved in the option. To have the energy option shown on transcripts, students should file appropriate forms with the dean's office during the first semester of the junior year.

Required Courses	
(Minimum of four including M E 697)	
M E 605	Thermal System Analysis and Design*
M E 697	Mechanical Engineering Seminar
M E 710	Solar Heating Systems
Ch E 705	Natural and Synthetic Fossil Fuel
Ch E 712	Introduction to Nuclear Engineering
Electives (1)	
M E 708	Gas Dynamics
M E 696	Mechanical Engineering Projects

*Replaces M E 504, Thermodynamics II.

Physics

(For descriptions of courses, see page 179.)

Physics is concerned with the properties of matter and the laws that describe its behavior. It is an exact science based on precise measurement, and its objective is the kind of understanding that leads to the formulation of mathematical relationships between measured quantities. As a fundamental science, its discoveries and laws are basic to understanding in nearly all areas of science and technology. Advances in such diverse fields as medical instrumentation, solid state electronics, and space research have relied heavily on the application of basic physical laws and principles.

Students interested in the study of physics at the University of New Hampshire will find a strong interaction between research and academic programs. Undergraduates have participated in research studies ranging from atomic spectroscopy using laser sources to astrophysical studies of the solar system using space probes. These experiences have proven beneficial to engineering and physics students alike. The department has its own library, which provides a comfortable, inviting atmosphere for study and relaxed reading.

The suggested programs that follow are indicative of the flexibility available to students, whether they are preparing for graduate work in physics, industrial opportunities, governmental research, secondary-level teaching, or a general education that might utilize the fundamental knowledge of physics.

The following undergraduate degree programs are offered through the Department of Physics. Interested students may consult with the department chairperson.

Bachelor of Science in Physics

This degree is the professional program offered by the department. The required courses are those necessary for admission to graduate work or a career in industry. Additional courses may be beneficial for graduate preparation or may be desirable for more depth in certain areas of physics. Students are strongly advised to learn French, German, or Russian.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy bachelor of science requirements (page 53).
3. One course in English is required in addition to the University requirement.
4. Minimum physics requirements: 407-408, General Physics I and II; 505, General Physics III; 515-516, Physical Mechanics I and II; 602, Thermal Physics; 605-606, Experimental Physics I and II; 607, Optics; 701-702, Introduction to Quantum Mechanics I and II; 703-704, Electricity and Magnetism I and II; and 705-706, Experimental Physics III and IV.
5. Chemistry: 403-404.
6. Math: 425-426; 527; 528; 646; C S 410.
7. By the end of the Spring semester of the sophomore year, a student must have a minimum grade of C− in all courses required for the major in order to continue in the B.S. program.

Physics Electives

Additional physics courses may be selected from the following: 791, Special Topics; 718, Introduction to Solid State Physics; 795, Independent Study; 710, Introduction to Astrophysics.

Suggested Curriculum for Bachelor of Science Degree in Physics

Freshman Year		Fall	Spring
C S 410	Introduction to Computer Programming	4	—
Phys 407	General Physics I	—	4
Math 425-426	Calculus I and II (Group 2)	4	4
Chem 403-404	General Chemistry (Group 3)	4	4
Engl 401	Freshman English (Group 1)	4	—
Elective	General Education Requirement (Group 5)	—	4
		16	16
Sophomore Year			
Phys 408	General Physics II	4	—
Phys 505	General Physics III	—	4
Phys 515-516	Physical Mechanics I and II	3	3
Math 527-528	Differential Equations with Linear Algebra	4	4
Elective	General Education Requirement: English 515 or 516 (Group 4)	4	—
Elective	General Education Requirement (Group 7)	—	4
		15	15
Junior Year			
Phys 605-606	Experimental Physics I and II	4	4
Phys 701	Introduction to Quantum Mechanics I	—	4
Phys 703-704	Electricity & Magnetism I and II	4	4
Math 646	Analysis for Applications	4	—
Elective	General Education Requirement (Group 3)	—	4
Elective	General Education Requirement (Group 6)	4	—
		16	16
Senior Year			
Phys 602	Thermal Physics	4	—
Phys 702	Introduction to Quantum Mechanics II	4	—
Phys 705	Experimental Physics III	4	—
Elective	General Education Requirement (Group 8)	—	4
Phys 607	Optics	—	4
Phys 706	Experimental Physics IV	—	4
Electives	Free (Physics 718 suggested)	4	4
Elective	General Education Requirement (Group 7)	4	—
		20	16

Bachelor of Arts, Physics Major

This degree provides an opportunity for a broad and liberal education, which in some cases may be sufficient for graduate work. A judicious choice of electives may also prepare students for interdisciplinary programs that require proficiency in a restricted area of physics.

Requirements

1. Satisfy General Education Requirements.
2. Satisfy bachelor of arts degree requirements (page 17).
3. Phys 407-408, 505. Note that Math 425 and 426 are prerequisites for some of the courses.
4. Five additional courses in physics approved by the department, three of which must be at the 500 level or above.
5. Math requirements: 425-426, Calculus I and II.

Bachelor of Arts, Chemistry and Physics Teaching

For information, see page 58.

School of Health Studies

Basil J. F. Mott, Dean
Robert Puddy, Associate Dean

Departments

Communication Disorders
Health Administration and Planning
Leisure Management and Tourism
Medical Technology
Nursing
Occupational Therapy
Physical Education

Programs of Study

Bachelor of Science
Communication Disorders
Health Administration and Planning
Leisure Management and Tourism
  Program Administration
  Therapeutic Recreation
  Tourism and Park Management
Medical Technology
Nursing
Occupational Therapy
Physical Education
  Athletic Training
  Exercise Specialist in Health Maintenance
  Outdoor Education
  Sports Communication
  Teacher Certification

Purposes and Programs

The School of Health Studies, established in 1968, is one of the newest academic components of the University. It was created in response to the growing need for programs in higher education that prepare young men and women for health and health-related careers. Currently, the school offers undergraduate instruction leading to the bachelor of science degree in communication disorders, health administration and planning, leisure management and tourism, medical technology, nursing, occupational therapy, physical education. Each program has been designed to enable students to acquire the basic knowledge and skills needed to practice their chosen professions and at the same time to obtain a broad cultural background in the humanities and social sciences.

Undeclared Major* A very limited number of well-qualified students, who have expressed an interest in a health-related career but who are undecided about a specific major, may enter the School of Health Studies as undeclared students. The program of study for undeclared students includes the following required courses:

Engl 401	Freshman English
Psyc 401	Introduction to Psychology
Zool 507-508	Human Anatomy and Physiology

Undeclared students should explore possible majors by taking courses in the programs that interest them most.

Recommended Courses:

Chem 403-404	General Chemistry
Comm 520	Survey of Communication Disorders
HAP 401	U.S. Health Care Systems
HAP 402	Public Health and Epidemiology
LM T 455	Introduction to Recreation and Park Services
LM T 501	Leisure Services for the Handicapped
MedT 401	Introduction to Medical Technology
Nurs 505	Nursing—A Developing Profession
Nutr 475	Nutrition in Health and Disease
PhEd 500	Perspectives in Physical Education
Polt 402	American Government and Politics
Psyc 581	Child Development
Soc 400	Introductory Sociology

Undeclared students should be prepared to declare a major by April when they preregister for the fall semester of the sophomore year.

*Limited to entering freshmen only.

Degree Requirements

Candidates for the B.S. degree must satisfy all General Education Requirements for graduation as listed on page 15, earn at least 128 credits, successfully complete the courses required in one of the curricula described in this section, and achieve the required minimum grade-point average in the chosen curriculum. Generally, courses are to be completed in the sequence in which they are arranged.
Minors: See page 18 for requirements. See also Interdisciplinary Minors, page 21.
Dual-Degree Programs: See page 17 for requirements.
Student-Designed Majors: See page 82 for requirements.
Second Majors: See page 18 for requirements.

Student Liability Insurance All students whose programs require participation in clinical learning experiences must purchase and maintain liability insurance for the entire clinical experience. Proof of such insurance coverage must be furnished to the department before the clinical experience begins. The University has arranged for appropriate insurance coverage at a modest cost to students. Further information may be obtained at major department offices.

Programs of Study

Communication Disorders

(For descriptions of courses, see page 114.)

Communication disorders is the profession devoted to helping people overcome disabilities of speech, language, or hearing. The study of communication disorders begins in the freshman year. Students learn about speech, language, and hearing disorders in the usual classroom setting and then become involved in clinical practice. This opportunity is provided in an on-campus clinic. Students are encouraged to take elective courses in academic areas

such as human development, learning theory, early childhood, health administration, special education, or various aspects of rehabilitation.

Students' professional education should be continued at colleges or universities offering graduate programs leading to a master's degree and to subsequent certification by the American Speech and Hearing Association. Certified clinicians find employment opportunities in hospitals, schools, community speech and hearing clinics, or private practice.

Students in the communication disorders program must: 1) complete a course in statistics; 2) obtain at least a 2.67 grade-point average in their first three communication disorders courses; and 3) maintain a minimum 2.67 grade-point average in all communication disorders courses. The required courses in communication disorders, which all students in the program must successfully complete, are: 520, Survey of Communication Disorders; 521, Anatomy and Physiology of the Speech and Hearing Mechanism; 522, The Acquisition of Language; 524, Applied Phonetics; 530, Technical Skills in Speech Pathology; 631, Speech Pathology I; 632, Speech Pathology II; 634, Clinical Practice in Speech Pathology; and 704, Basic Audiology. Other elective courses are available.

Students interested in this program should consult with the chairperson, F. Harry Tokay.

Health Administration and Planning

(For descriptions of courses, see page 147.)

Students in the Health Administration and Planning Program are prepared to embark upon administrative and planning careers in hospitals and health care agencies. Graduates work in various settings, such as medical centers, hospitals, long-term care facilities, health maintenance organizations, community mental health centers, insurance companies, home health agencies, environmental health agencies, and regulatory agencies.

The academic program is interdisciplinary, with undergraduates taking courses in many academic units of the University. Students gain a broad view of health and develop analytical skills in such areas as economics, politics, and management—all applicable to health organizations. The curriculum is organized to assist students in developing competencies in five areas. A list of these competencies is available from the program office.

Two plans are available for achieving the competencies required for graduation: the academic program for full-time students who have recently graduated from high school and the adult experiential option designed primarily for individuals who have substantial professional experience and desire to pursue the course of study while maintaining their professional affiliation.

The department is an approved full member of the Association of University Programs in Health Administration (AUPHA).

Premedical and Predental Education

Students interested in careers in medicine and dentistry can complete required courses (see page 81) as electives while completing this major. Students selecting this approach must devote the summer between their junior and senior years to a full-time field practicum.

Academic Program for Full-time Students

Competencies are achieved through four components of the curriculum: University General Education Requirements, core area, special interest area, and collateral studies. Students must work closely with their assigned advisers to develop a plan of study for each of these components.

General University Requirements Advisers can assist students in selecting courses that will satisfy certain program expectations and simultaneously meet University General Education Requirements.

Core Area Students will enroll in 1) introductory courses: HAP 401, U.S. Health Care Systems; HAP 402, Public Health and Epidemiology; HAP 502, Fundamentals of Medical Care Delivery; and 2) integrative courses: HAP 721, Hospital and Health Services Administration; and HAP 723, Health Planning; HAP 740, Management Accounting for Health Care Organizations; HAP 741, Quantitative Methods for Health Care Organizations; and HAP 742, Multi-Institutional Health Care Systems.

Practicum The 16-week field practicum, an essential part of the academic program, helps integrate classwork through a supervised work experience and allows students to explore an area of special interest in depth. Courses include: HAP 621, Prepracticum Seminar; and HAP 622, Field Practicum. Field Practicum sites are selected by faculty and are concentrated in northern New England.

Collateral Area A basic understanding is expected in the following areas: economics, mathematics, American social systems, accounting, and statistics. Advisers will work with students to select appropriate courses.

Program Review The faculty reviews student performances during the semester before the practicum to determine each student's readiness.

Academic Minor in Health Administration An integrated minor is available to students majoring in communications disorders, nursing, medical technology, occupational therapy, therapeutic recreation, and social service desiring to acquire basic competencies in health administration.

External Degree Option for Adult Learners

This option is designed to make the B.S. with a major in health administration and planning more accessible to mature learners, many of whom have

already begun a health care career. Previous learning experiences are assessed in relation to competencies established as part of degree requirements through HAP 700, Health Administration and Planning: Competency Assessment. Innovative educational technologies are used to aid independent learning. Many adult learners pursue the degree while continuing to work full time without living in the Durham area. Students interested in the program should consult with the chairperson.

Leisure Management and Tourism

(For descriptions of courses, see page 154.)

The effective use of leisure opportunities and individual resources has been identified as the most challenging opportunity and responsibility for an individual and society in the coming decade.

Tourism is rated the first or second industry in many states; one in every fifteen Americans works in a job related to leisure. Both population and economic projections suggest that tourism and leisure service industries will continue to expand and thereby provide numerous professional career opportunities.

The professional preparation of students centers on three options of study: program administration, therapeutic recreation, and tourism and park management. Depending on the option selected, students focus on the organization, planning, development, and management of leisure services and resources within a variety of settings.

Internal transfer students must have a minimum 2.33 cumulative grade-point average for admission to the major. Students within the major are required to maintain a minimum 2.33 cumulative grade-point average. In addition, to graduate, students must obtain a minimum grade of C (2.00) in all courses specifically required by the department.

The department has been awarded national NRPA/AALR accreditation as a professional preparation program.

Core Courses

All majors must complete a core curriculum of six courses: LM T 455, Introduction to Recreation and Park Services; LM T 501, Leisure Services for the Handicapped; LM T 557, Leisure Service Program Design; LM T 663, Recreation and Park Administration; LM T 772, Law of Recreation Resources and Leisure Services; LM T 798, Recreation and Leisure Research Seminar.

The internship (LM T 664), required of all majors, is an eight-credit module completed during the summer between the student's junior and senior year. It is designed to bridge the gap between theory and practical application. Students working with their advisers and the internship coordinator select an appropriate setting, based on their professional and career interests. They must complete a minimum of 480 hours of supervised field study within twelve weeks. Specific requirements are identified in the Internship Manual available from the leisure management and tourism office.

Cognate Area

Students are required to work with their advisers to identify five courses that will support an area of professional interest.

Program Administration Option This option prepares students for supervisory positions. Program planning, marketing, implementation competencies, and administrative concepts are emphasized within the option. Community recreation departments, YM/YWCAs, youth-serving agencies, health clubs, senior citizen centers, outdoor recreation centers, and resorts are examples of settings in which students may expect to find employment.

In addition to the required core courses, students complete the following departmental requirements: LM T 554, Recreation Business Management; LM T 558, Program Supervision and Leadership; LM T 665, Information Retrieval and Communication in Leisure Services; LM T 664A, Internship in Program Administration.

The required University courses are: Engl 401, Freshman English or Engl 501, Introduction to Prose Writing; ThCo 403, Public Speaking; Inco 491, Computer Literacy or approved equivalent; Soc 502, Statistics; Psyc 401, Introduction to Psychology; FCS 525, Human Development; Admn 580, Introduction to Organizational Behavior; PhEd 501, Advanced First Aid and Emergency Care.

Therapeutic Recreation Option This option prepares students to work primarily in clinical facilities such as hospitals, rehabilitation centers, state institutions, mental health centers, and extended care facilities to focus on therapeutic recreation services while achieving overall treatment goals. The program of study is designed to help students meet requirements for the National Council for Therapeutic Recreation Certification.

In addition to the required core courses, students complete the following departmental requirements: LM T 502, Introduction to Therapeutic Recreation; LM T 603, Principles of Therapeutic Recreation; LM T 604, Clinical Aspects & Techniques in Therapeutic Recreation; LM T 664B, Internship in Therapeutic Recreation.

The required University courses are: Engl 401, Freshman English or Engl 501, Introduction to Prose Writing; ThCo 403, Public Speaking; Inco 491, Computer Literacy or approved equivalent; Psyc 401, Introduction to Psychology; Psyc 402, Statistics in Psychology; Psyc 461, Clinical Approaches to Human Behavior; Zool 507, Human Anatomy and Physiology; Zool 508, Human Anatomy and Physiology; PhEd 652, Clinical Kinesiology.

Tourism and Park Management Option This option stresses the business, natural, and human resource elements of private and public recreation planning and management. Within the option, a student may emphasize specific aspects of park resources (such as planning, interpretive services, and wilderness management) or concentrate in a particular area of tourism business management (such

as marketing, attraction management, operations, and tourism planning).

In addition to the required core courses, students complete the following departmental requirements: LM T 554, Recreation Business Management; LM T 661, Tourism and Park Management; LM T 667, Tourism and Park Planning; LM T 766, Impacts of Tourism; LM T 664C, Internship in Tourism and Park Management.

The required University courses are: Engl 401, Freshman English or Engl 501, Introduction to Prose Writing; ThCo 403, Public Speaking; Admn 424, Business Statistics; REco 411, Introduction to Resource Economics; Admn 550, Survey of Marketing; Admn 580, Introduction to Organizational Behavior.

Leisure and Recreation Study in Scotland A sixteen-week program sponsored by the American Universities International Program is held each year during the spring semester at the University of Edinburgh, Scotland. Registration is limited. One year prior to departure, curriculum director approval is required. Sixteen credits can be granted.

Medical Technology

(For descriptions of courses, see page 161.)

Medical technology is a challenging and rewarding profession for students interested in laboratory medicine. Medical technologists are vital members of the health team who perform various medical laboratory tests and provide the diagnostic assistance required in modern patient care. Medical technologists may be employed in hospitals, research, or a variety of industrial settings.

Students entering the program spend their freshman, sophomore, and junior years on campus. During the spring semester of the senior year, approximately 26 weeks will be spent at Mary Hitchcock Memorial Hospital in Hanover, New Hampshire, where students will complete clinical courses MedT 751–754. Student costs include a fee each semester for laboratory and clinical instruction. Upon successful completion of the program, students are awarded a B.S. degree and are qualified to take a national certification examination.

Academic requirements are as follows: students must obtain a grade of C (2.00) or better in Micr 503 and 702, Chem 545-546, and Bchm 656. A minimum grade of C is required in all medical technology courses and C− in Chem 517-518 and Micr 705. By the end of the spring semester, sophomore year, a student must have attained a cumulative grade-point average of 2.50 to continue in the major.

Evaluation of a student's academic performance and personal interviews with the clinical faculty are required. These interviews evaluate a student's understanding of the profession, communication skills, supervisory potential, maturity, and self-confidence. Students must demonstrate these attributes to participate in the clinical courses.

Students interested in this program should consult the chairperson, Karol LaCroix.

Career Mobility Option This option is designed to make the B.S. degree in medical technology available to certified laboratory assistants, medical laboratory technicians, military trained laboratory personnel, and other individuals with at least two years of full-time recent experience in the clinical laboratory. This may be done on a full- or part-time basis by taking prerequisite courses at UNH or other accredited institutions throughout the state. Students have the opportunity to challenge clinical course requirements through credit by examination. A series of written and practical examinations is available in the areas of chemistry, hematology, urinalysis, microbiology, immunohematology, and immunology. Students interested in the option should contact the chairperson of the medical technology program.

Freshman Year		Fall	Spring
MedT 401	Introduction to Medical Technology	—	0
Zool 507-508	Human Anatomy and Physiology	4	4
Chem 403-404	General Chemistry	4	4
Engl 401	Freshman English	4	—
Electives (3)		4	8
		16	16
Sophomore Year			
Chem 545-546	Organic Chemistry	5	—
Micr 503	General Microbiology	5	—
MedT 625	Clinical Lab Methods I	4	—
MedT 626	Clinical Lab Methods II	—	4
Micr 602	Pathogenic Microbiology	—	4
Bchm 656	Physiological Chemistry and Nutrition	—	4
Electives (2)		4	4
		18	16
Junior Year			
MedT 651	Clinical Microbiology	4	—
MedT 652	Clinical Hematology	4	—
MedT 653	Clinical Immunohematology	4	—
MedT 654	Clinical Chemistry	4	—
MedT 720	Clinical Mycology/ Parasitology	—	4
Zool 504	Heredity and Evolution	—	4
Electives (2)		—	8
		16	16
Senior Year*			
Chem 517-518	Quantitative Analysis	5	—
Micr 705	Immunology and Serology	4	—
MedT 602	Med Lab Seminars	1	—
MedT 751	Diagnostic Microbiology	—	4
MedT 752	Advanced Hematology	—	4
MedT 753	Advanced Immunohematology	—	4
MedT 754	Advanced Clinical Chemistry	—	4
Math 536	Introductory Statistical Inference	4	—
Elective (1)		4	—
		18	16

*Students will spend the spring semester at Mary Hitchcock School of Medical Technology in Hanover, New Hampshire.

Nursing

(For descriptions of courses, see page 167.)

The baccalaureate program aims to develop the student as a skilled practitioner of nursing with abilities to assist individuals or groups in promoting health needs, preventing illness, and caring for the sick. The student functions from a background of knowledge in the liberal arts and humanities and in the sciences basic to nursing, as well as in nursing itself. The objectives are to help the student gain necessary knowledge and skills to practice nursing in a variety of health care facilities, to foster accountability and commitment in the student, and to help individuals maximize their level of health.

The graduate is able to begin the practice of nursing and therefore can: 1) assess the needs of an individual for nursing care; 2) develop, implement, and evaluate a plan of care; 3) provide care from a framework of behavioral and natural sciences; 4) function as an advocate for clients; and 5) work as a collaborative member of a health team. A student who completes the requirements for the bachelor of science degree is eligible to take the state board examination and has the background required to pursue graduate study. The program is accredited by the National League for Nursing.

Hospitals and many community health-related agencies are used for learning experiences. Students are responsible for their own transportation to the clinical laboratories as well as for purchase of uniforms to be worn there. A physical examination and selected immunizations, at student expense, are required within the six months before the first clinical nursing course.

All generic nursing students must pay a lab fee each semester. Current CPR certification, liability, and health insurance coverage are required of all students in clinical courses.

All students are required to take the following prerequisite courses: 1) Prior to entering the first nursing course (Nurs 505): Engl 401, Zool 507-508, Psyc 401, and Soc 400; 2) Prior to entering the junior year nursing courses: Bchm 501, Micr 501-502, FCS 525, Nutr 475, and Statistics.

All students are required to achieve a minimum of C (2.00) in *each* prerequisite course. Prerequisite courses may be repeated one time only. A cumulative grade-point average of 2.33 must be attained by the end of the sophomore year and maintained throughout each semester of the junior and senior years. Students must earn a minimum grade of C (2.00) in both classroom (theory) and clinical (practice) components of each nursing course in order to pass that course and progress to the next level. Attendance in class and clinical area is mandatory.

Expanding Baccalaureate Opportunities for Registered Nurses (EBORN)

RN students who hold a current license to practice as a registered nurse are admitted to the baccalaureate program. The baccalaureate degree for RNs is designed as an individualized, competence-based program which permits a variable learning pace and continuation of present work and/or family responsibilities. Advanced standing and course credit in the B.S. program may be earned through transfer credit and challenge examinations. The program does not include blanket endorsement of all previous education. However, credits in the nursing component are awarded for documented knowledge and competence gained through previous educational and work experiences. Individualized plans of study enable the student to meet the standards of the remaining areas of professional nursing competence. The length of the program depends upon an individual's past experiences, interest and ability to achieve, and advanced placement.

Students interested in this program should consult with the chairperson, Juliette Petillo.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Psyc 401	Intro. to Psychology	—	4
Zool 507-508	Human Anatomy & Physiology	4	4
Soc 400	Introd. Sociology	—	4
Nutr 475	Nutrition in Health & Disease	3	—
Electives (2)		4	4
		15	16
Sophomore Year			
Bchm 501	Biological Chemistry	4	—
Micr 501	Public Health Microbiology	3	—
Micr 502	Public Health Microbiology Laboratory	1	—
Nurs 505	Nursing—A Developing Profession	2	—
Nurs 507	CPR	1	—
FCS 525	Human Development	—	4
Nurs 510	Foundations of Nursing Practice	—	4
Statistics		—	4
Electives (3)		5–8	4
		16–19	16
Junior Year			
Core courses			
Nurs 601	Nursing I	4	—
Nurs 610	Nursing II	—	4
Modular courses*		8	8
Nurs 601C	Nursing of Adults I		
Nurs 601D	Nursing of Children		
Nurs 601E	Nursing of the Childbearing Family		
Nurs 610C†	Nursing of Adults II		
Nurs 610D†	Nursing in the Community		
Nurs 610E†	Nursing in Mental Health		
Electives (2)		4	4
		16	16

Senior Year			
Core courses			
Nurs 621	Nursing III	4	—
Nurs 629	Nursing Research	—	2
Nurs 630	Nursing Leadership	—	2
Modular courses*		8	8
Nurs 610C	Nursing of Adults II		
Nurs 610D	Nursing in the Community		
Nurs 610E	Nursing in Mental Health		
Nurs 621C	Nursing of Adults III		
Nurs 630C	Senior Practicum		
Electives (2)		4	4
		16	16

*Each student will be assigned two 4-credit modules per semester.
†All Nurs 610 modules not completed in the junior year must be taken in the senior year.

Occupational Therapy

(For descriptions of courses, see page 171.)

The curriculum is accredited by the Committee on Allied Health Education and Accreditation/ American Medical Association in cooperation with the Accreditation Committee of the American Occupational Therapy Association. Two years of liberal arts courses and two years of professional study constitute the prescribed program leading to the bachelor of science degree. The program includes five major areas: the basic human sciences, the human development process, the health-illness-health continuum, specific life tasks and activities, and occupational therapy theory and practice. Occupational therapy practice is directed toward enabling or restoring individual capacity for functional independence and adaptation in the context of clients' environments. Observation and guided practice in local clinical situations are an integral part of several courses.

Following completion of the four-year academic program, students are placed in three, three-month full-time fieldwork experiences. Completion of these three placements qualifies students to sit for the national certification examination of the American Occupational Therapy Association.

To continue in the major, students must meet the following criteria:

1. By the end of spring semester, freshman year, the student must have:
   a) a 2.33 cumulative grade-point average in required courses (Engl 401, Psyc 401, Psyc 581, Zool 507, and Zool 508);
   b) a minimum grade of 2.00 in Zool 507 and Zool 508.
2. By the end of fall semester, sophomore year, the student must have a minimum of C (2.00) in O T 510.
3. By the end of spring semester, sophomore year, the student must have:
   a) a 2.33 cumulative grade-point average in courses required for the major;
   b) a minimum grade of C (2.00) in O T 512.
   c) completed one O T 588-Level I Fieldwork experience.
4. By the end of spring semester, junior year, the student must have a 2.33 cumulative grade-point average in courses required for the major and have completed two O T 588-Level I Fieldwork experiences.
5. To qualify for graduation, the student must have:
   a) a 2.33 cumulative grade-point average in courses required by the major, with the exception of the course in statistics;
   b) a minimum grade of C (2.00) in PhEd 606, 652; O T 515, 581, 582, 583, 624, 633, and 634 (these may be repeated only once);
   c) successful completion of O T 588.

Courses required for the major are those specified in the following list with the exception of electives. Curriculum review and revision is undertaken annually; students are expected to check with their departmental advisers in September for updated policies and requirements. Students are responsible for transportation to off-campus clinical and other learning experiences and must purchase personal liability insurance for coverage for the clinical components of the curriculum.

Freshman Year		Fall	Spring
Engl 401	Freshman English	4	—
Psyc 401	Introduction to Psychology	4	—
Psyc 581	Child Development	—	4
Zool 507-508	Human Anatomy and Physiology	4	4
Electives (3)		4	8
		16	16
Sophomore Year			
O T 588	Level I Fieldwork: One-Week Fieldwork Experience	—	0
Any Sociology course except Soc 602		4	—
O T 510	Occupational Therapy Theory I	4	—
O T 512	Problem Solving in Occupational Therapy	—	2
O T 531	Group Process	2	—
O T 600	Developmental Tasks of Adulthood	—	4
Psyc	Any Psyc course except Psyc 401, 402, or 581	—	4
Electives (3)		6	6
		16	16
Junior Year			
O T 588	Level I Fieldwork: One-Week Fieldwork Experience	—	0
O T 515	Treatment Media Analysis	4	—
O T 581	Medical Concepts for Occupational Therapists	4	—
PhEd 652	Clinical Kinesiology	4	—
O T 582	Occupational Therapy Theory II: Rehabilitation Techniques	—	4

O T 583	Occupational Therapy: Psychiatric Foundations	—	4
PhEd 606	Neurology	—	4
Electives (2)		4	4
		16	16
Senior Year			
O T 588	Level I Fieldwork: One-Week Fieldwork Experience	—	1
O T 624	Occupational Therapy Treatment of Psychosocial Dysfunction	4	—
O T 633	Treatment for Physical Disabilities	4	—
O T 634	Systems of Therapeutic Intervention in Physical Disabilities	—	4
O T 691	Senior Project	2	—
O T 697	Transitions: Student to Professional	4	—
One statistics course from the following:			
Soc 502 or Psyc 402 or PhEd 668 or Math 536 or REco 701 or REco 528 or Educ 785		—	3–4
Electives		1–2	9
		15–16	17–18

Level II Fieldwork Experiences

O T 711 or	Psychosocial Dysfunction Field Work
O T 712 or	Physical Dysfunction Fieldwork
O T 713	Special Area Field Work

Upon completion of the prerequisite courses, students are scheduled for a minimum of nine months' supervised clinical fieldwork placements. These Level II Fieldwork experiences are scheduled in centers that have established educational programs and are approved by the department. The fieldwork experiences are divided into three-month periods as follows: O T 711, Psychosocial Dysfunction; O T 712, Physical Dysfunction; O T 713, Special Area. A physical examination including a tuberculin test is required before fieldwork experiences. Proof of poliomyelitis immunization is also required. Students are required to purchase liability insurance and health insurance for their off-campus Level II Fieldwork experiences. Level II Fieldwork is the fifth year of preparation for entry to the field. A fee is charged for the coordination of Fieldwork.

Eligible graduates make application for the July or January national certification examination through the department. A $100 fee is currently charged by the American Occupational Therapy Association for this examination.

Students must be aware that curriculum revisions are being considered; information will be available during new-student summer orientation and during the first week of classes.

Students interested in this program should consult the chairperson, Barbara Sussenberger.

Physical Education

(For descriptions of courses, see page 175.)

The Department of Physical Education offers five areas of study for majors: 1) athletic training; 2) exercise specialist in health maintenance; 3) outdoor education; 4) sports communication; and 5) teacher certification. Openings in options 1, 2, and 4 are limited.

Students who wish to minor in physical education must complete 20 credits of coursework that have been approved by a department minor adviser. No more than 6 of the 20 credits may be earned through activity or coaching courses.

Students interested in majoring or minoring in physical education should consult with the chairperson, Walter Weiland, or the assistant chairperson, Katherine Amsden.

Athletic Training Option This option prepares individuals for careers as athletic trainers. In addition to the courses listed below, work as a student trainer will be available to the student. Eligibility for the national certification examination requires 1,800 hours of practical work. PhEd 703 provides 600 hours. Students must earn a grade of B (3.00) or better in PhEd 502 and PhEd 503, and a grade of C (2.00) or better in all other required PhEd courses. Students may elect to complete both the athletic training and the teacher certification options, which will normally require four and one-half to five years. Interested students may consult with the option adviser, Robin Meeks.

Physical Education Required Courses

PhEd 501	Advanced First Aid and Emergency Care	2
PhEd 502	Basic Athletic Training	4
PhEd 503	Athletic Training Applied Techniques	2
PhEd 606	Neurology	4
PhEd 610	Adapted Physical Education	4
PhEd 620	Physiology of Exercise	4
PhEd 652	Clinical Kinesiology	4
PhEd 702	Advanced Athletic Training	4
PhEd 703	Laboratory Practice in Athletic Training	8
PhEd 780	Psychological Factors in Sport	4
PhEd activity courses	PhEd 470 (1 cr.); PhEd 475 (1 cr.); an individual sport (0.5 cr.); a team sport (0.5 cr.); a coaching course (2 cr.)	5

University Required Courses

Nutr 475	Nutrition in Health and Disease	3
Psyc 401	Introduction to Psychology	4
Zool 507-508	Human Anatomy and Physiology	8

Recommended Courses

Chem 401-402	Introduction to Chemistry	8
Phys 401	Introduction to Physics I	4
O T 581	Medical Concepts for Occupational Therapists	4

Exercise Specialist in Health Maintenance Option This curriculum prepares individuals for career opportunities in adult fitness programs in communi-

ties, health agencies, and industry. Exercise specialists work in physical activity programs of prevention, intervention, and cardiac rehabilitation. Students must earn a grade of C (2.00) or better in every required course. All required PhEd courses must be completed prior to enrolling in PhEd 650. Interested students may consult with the option adviser, Robert Kertzer.

Physical Education Required Courses		
PhEd activities	(must include 475 and one of the following: 447, 520, or 527)	6
PhEd 501	Advanced First Aid and Emergency Care	2
PhEd 502	Basic Athletic Training	4
PhEd 620	Physiology of Exercise	4
PhEd 621	Exercise Laboratory Techniques	3
PhEd 650	Exercise Specialist Internship	8
PhEd 652	Clinical Kinesiology	4
PhEd 668	Measurement Procedures in Physical Education	4
PhEd 722	Graded Exercise Testing and Exercise Prescription	4
PhEd 732	Electrocardiography	4
University Required Courses		
Bchm 501	Biological Chemistry	4
Chem 403-404	General Chemistry	8
Nutr 475	Nutrition in Health and Disease	3
Psyc 401	Introduction to Psychology	4
Psyc 461	Clinical Approaches to Human Behavior	4
Zool 507-508	Human Anatomy and Physiology	8

Outdoor Education Option The outdoor education option prepares individuals for careers working with diverse populations in public and private schools, organizations, and agencies. The techniques and approaches of adventure education represent the underlying philosophy of the curriculum. The option is interdisciplinary in scope, uses the various natural resources in the seacoast and mountain area, and gives students ample opportunity for practical application and field experience. Students must earn a grade of C (2.00) or better in every required course. Students seeking teacher certification should enroll in the teacher certification option and select additional appropriate courses in outdoor education. Interested students may consult with the option adviser, Michael Gass.

Physical Education Required Courses		
PhEd activities	(400-499, 533) Six outdoor education activities from recommended list (credits depend upon choices elected)	4-9
PhEd 501	Advanced First Aid & Emergency Care	2
PhEd 550	Outdoor Education Philosophy and Methods	4
PhEd 681	Theory of Adventure Education	4
PhEd 682	Outdoor Leadership (2 credits taken twice)	4
PhEd 683	Organization & Administration of Outdoor Education	4
PhEd 684	Emergency Medical Technician Training	3
PhEd 693C	Teaching Assistantship in Outdoor Education	2
PhEd 694A	Internship in Outdoor Education	2-4
University Required Courses		
Educ 703	Alternative Teaching Models	2-4
Engl 501	Introduction to Prose Writing	4
Psyc 401	Introduction to Psychology	4
Other	Core of courses emphasizing the particular area or population in outdoor education of interest to student (e.g., business, education, psychology) selected with assistance of an adviser.	16

Sports Communication Option The sports communication option combines substantive knowledge in sports with skills in mass communication, including sportswriting and sportscasting. A grade of B (3.00) or better is required in Engl 501 to continue in this option, and students must earn a grade of C (2.00) or better in each required PhEd course. Most students in the sports communication option also participate in the English department journalism program. For these students, an excellent record of performance in the writing courses is required. An internship experience is recommended for highly qualified students. Interested students may consult with the option adviser, Joyce Mills.

Physical Education Required Courses		
PhEd activities		6
PhEd coaching courses		6
PhEd 635	Sport in Literature	4
PhEd 668	Measurement Procedures in Physical Education	4
PhEd 741	Sport in Society	4
PhEd 780	Psychological Factors in Sport	4
PhEd 791	History of Physical Education	4
University Required Courses		
Engl 501	Introduction to Prose Writing	4
Engl 621	Newswriting	4
Psyc 401	Introduction to Psychology	4
Soc 400	Introductory Sociology	4
ThCo 402	Communication and Social Order	4
ThCo 403	Public Speaking	4
One of the following groups of courses:		
Engl 622	Newswriting	4
Engl 703	Advanced Nonfiction Writing	4
ThCo	Elective (a communication course)	4
ThCo 455	Introduction to Mass Communication	4
ThCo 556	Introduction to Television Production	4
Engl	Elective (a writing course)	4

Teacher Certification Option The teacher certification option provides a specialized professional background and a broad general education. Students may pursue coursework to prepare as generalists (all grade levels) or as either elementary or secondary specialists in physical education. In ad-

dition to the above, students may elect to complete a second option in athletic training. Students interested in outdoor education within the teaching field should elect appropriate outdoor education courses. A cumulative grade-point average of 2.20 and a grade-point average of 2.50 in all physical education courses is required to be eligible for student teaching. If, during any three semesters, a teacher certification student fails to achieve a cumulative grade-point average of 2.50 in physical education theory courses, the department will recommend to the dean of the School of Health Studies that the student be suspended for lack of progress toward fulfilling degree requirements. Interested students may consult with the assistant chairperson, Katherine Amsden.

Physical Education Required Courses		Credits
PhEd 470-479; 484-492	Physical Education Activities (for men and women)	9.5
and one of the following: PhEd 447, 520, 527, 533		1-2
PhEd 482	Physical Education Activity (for men)	0.5
PhEd 486	Physical Education Activity (for women)	0.5
One from the following: PhEd 410, 415, 416, 427, 428, 433, 434, 435, 437, 438, 439, 453, 533		0.5-1.0
One course from the following: PhEd 411, 412, 414, 417, 420, 421, 422, 423, 424, 432		0.5
PhEd 500	Perspectives in Physical Education	4
PhEd 501	Advanced First Aid & Emergency Care	2
PhEd 610	Adapted Physical Education	4
PhEd 620	Physiology of Exercise	4
PhEd 625	Dynamics of Human Movement	4
PhEd 668	Measurement Procedures in Physical Education	4
PhEd 775	Perceptual Motor Learning	4
One of the following:		
PhEd 563	The Theory of Teaching Physical Education in the Secondary School	4
PhEd 692	Theories of Teaching Physical Education in the Elementary School	4

Education Required Courses		
Educ 500	Exploring Teaching	4
Educ 700	Educational Structure and Change	2
Educ 701	Human Development and Learning: Educational Psychology	4
Educ 705	Alternative Perspectives on the Nature of Education	4
Educ 707	Approaches to Teaching Reading at the Secondary Level	2
Educ 694	Supervised Teaching of Physical Education	8

University Required Courses		
Psyc 401	Introduction to Psychology	4
Zool 507-508	Human Anatomy and Physiology	8

Whittemore School of Business and Economics

Dwight R. Ladd, Dean
Rita P. Weathersby, Associate Dean
George T. Abraham, Assistant Dean
Wayne M. Burton, Assistant Dean of Administration
Jo-Ann Kelly, Advising Coordinator
Barbara A. Millar, Graduate and Development Programs Coordinator

Programs of Study

Bachelor of Arts
Economics

Bachelor of Science
Administration
Hotel Administration

Purposes and Programs

The Whittemore School of Business and Economics was established July 1, 1962, through the efforts of the late Laurence F. Whittemore, noted industrialist and long-time trustee and chairman (1955–60) of the UNH Board of Trustees. Since 1969, the school has been housed in McConnell Hall, named for Dr. John W. McConnell, the fourteenth president of the University (1963–71).

The basic intent of the Whittemore School's undergraduate curricula is to combine a breadth of liberal education with specifics of professional training in administration, economics, and hotel administration. Undergraduates enrolled in the Whittemore School programs must take a substantial part of their course work in other colleges in the University in order to fulfill the General Education Requirements. Beyond those requirements, students are encouraged to elect additional courses in the arts, the behavioral and social sciences, the humanities, mathematics, and the natural sciences. Thus, students who complete the Whittemore School programs in administration, economics, and hotel administration are prepared for employment and graduate study in both these and adjacent fields.

Minors are offered in administration and economics. Within the limits of its resources, the Whittemore School also intends to serve the needs of undergraduates elsewhere in the University for whom selected courses in administration, economics, or hotel administration are desirable complements to their primary course of study. To the extent that space is available after majors have enrolled, many Whittemore School courses are open to nonmajors who have the prerequisite preparation.

Degree Requirements

The Whittemore School offers a bachelor of arts degree program in economics and bachelor of science degree programs in administration and hotel administration. Candidates for a degree must satisfy all of the University General Education Requirements for graduation as well as the particular requirements of their individual major programs. In addition, candidates must meet a computer literacy requirement and show proficiency in writing. Economics majors must also satisfy specific requirements associated with the bachelor of arts degree. (See page 17.) No Whittemore School course may be taken on a pass/fail basis by a student majoring in administration, economics, or hotel administration.

Modifications tend to occur in major programs during the four-year period of a student's undergraduate career. Students are expected to conform to these changes insofar as they do not represent substantive alterations in their courses of study.

For information concerning advanced degrees, see the Graduate School catalog.

Advising System

Undergraduate advising in the Whittemore School is carried out jointly by academic counselors and the faculty. The academic counselors are based in the dean's office, where student academic records are kept. The counselors assist students in program planning, preregistration, understanding and meeting general academic requirements, and general academic and career decision making. The faculty draw on their own experience, expertise, and interests in helping students with course, program, and career selection.

Students are not officially assigned to faculty advisers, but are provided with a Whittemore School *Faculty Profiles* booklet, which contains considerable information about faculty members' education, experience, and current teaching and research interests. Undergraduates are encouraged to develop an advisory relationship with one or more faculty members with whom they have mutual interests. Students who prefer a more formally structured arrangement are urged to notify an academic counselor. All students are urged to seek as much assistance as they need, from whatever source, but are reminded that theirs is the ultimate responsibility for knowing and meeting the various academic requirements for a degree.

Independent Study/Internship

Juniors or seniors in the Whittemore School may elect the internship or independent study options for variable credit. For either option, the student must secure a faculty sponsor in the area of interest and submit a proposal prior to the semester in which the project is to be undertaken. Independent study normally involves research, while internships are usually undertaken with cooperation of an off-campus organization and involve a nonroutine but practical application of skills and concepts acquired in a student's program.

Independent studies and internships require considerable self-direction and self-monitoring on the part of the student, and careful prior review of requirements with the undergraduate adviser is necessary.

The Washington internship is open to any major. See page 191.

International Study

Students are encouraged to pursue international study through study abroad programs. A dual major is offered in conjunction with the Program for International Perspectives. See page 85.

Five-Year Programs: B.A.-M.B.A., B.S.-M.B.A.

The Whittemore School and the College of Engineering and Physical Sciences offer a joint program leading to a bachelor of science (B.S.) in chemical engineering, civil engineering, electrical engineering, or mechanical engineering and a master of business administration (M.B.A.) in five years rather than the normal six. Similarly, with the College of Liberal Arts, the Whittemore School offers a joint program leading to a B.A. in French, history, philosophy, or psychology and an M.B.A. The College of Life Sciences and Agriculture and the Whittemore School offer a joint program leading to a B.S. in plant science and an M.B.A. See the individual college descriptions for details.

Programs of Study

Administration

(For descriptions of courses, see page 96.)

The administration program provides training for young men and women interested in managerial or administrative careers in business or in public or private institutions.

Since most graduates of the program embark upon business careers, the program emphasis is in that direction. However, as demand has grown in recent years for people able to apply businesslike methods to the problems of nonprofit institutions such as hospitals, school systems, government departments, and other socially oriented organizations, the program's objectives have been broadened considerably to include all types of administration.

The curriculum offers professional education in the basic theories, principles, concepts, and analytical tools used by successful modern administrators, combining them with an introduction to some of the important functional areas of management. At the same time, typical students achieve a well-rounded education by selecting courses in the liberal arts and the sciences from other colleges and schools in the University.

The administration program consists of 11 required courses in three groupings, plus two required WSBE electives. Group A includes the core courses taken in the freshman and sophomore years. These focus on basic concepts, tools, and skills. Group B consists of four courses in the functional areas of organizational behavior, production, marketing, and finance, normally taken in the junior and senior years. Group C consists of Business and Its Environment and the final capstone course in administration, Business Policy. These are taken in the senior year.

Students must successfully complete all Group A courses, achieving a minimum grade-point average of 2.00 in them, before any Group B courses may be taken; and all Group B courses must be completed before taking Group C courses. In order to graduate, students must achieve a grade-point average of at least 2.00 in the 13 major courses. Transfer credit can be applied only to Group A courses.

Students are encouraged to take advanced electives in areas of their interest and in relation to career goals. Faculty and the undergraduate counselors can provide useful information and guidance for choices of electives.

The Whittemore School also offers courses for nonmajors. Students interested in these courses should contact the Advising Office.

The recommended plan of study is given below:

Freshman and Sophomore Years (Group A)

Econ 401, Principles of Economics (Macro); Econ 402, Principles of Economics (Micro); Admn 424, Business Statistics; Admn 502, Financial Accounting; Admn 503, Managerial Accounting

Junior and Senior Years (Group B)

Admn 611, Behavior in Organizations; Admn 650, Operations Management; Admn 651, Marketing; Admn 653, Financial Management

Senior Year (Group C)

Admn 701, Business and Its Environment; Admn 703, Business Policy; two WSBE electives

Minor The Whittemore School faculty has developed a group of courses for nonmajors that, combined with certain other courses, can constitute a minor in administration. A list of minor requirements is available in the Whittemore School advising center, room 120 McConnell Hall.

Economics

(For descriptions of courses, see page 122.)

Economics is the study of the allocation of scarce resources among competing uses, either through use of conscious public policy or through impersonal market forces. The analytical skills of economists are useful in evaluating alternative methods of achieving these goals and in the formulation of new approaches to problems in these areas.

The economics program is designed to introduce students to the tools of economic analysis and to an understanding of the areas to which they may be usefully applied.

While undergraduate training in economics may not qualify students as professional economists (those intending such a career should plan on graduate study), it is regarded by employers as a highly desirable background for business or government. In recent years, economics graduates have competed on a favorable basis for business and government jobs with graduates in other areas, including administration. Undergraduate economics training is an excellent background for graduate work in law, business administration, and international relations, as well as economics.

Students planning to pursue graduate study in economics should consult with their advisers or

faculty members early in the academic program to assist in their selection of an appropriate graduate school and to aid in gaining admission.

Courses in economics, including a minor program, are open to nonmajors. Students majoring in other programs may find certain economics courses useful supplements to their own majors and a help in future employment. Political science majors may be interested in courses in economic development, comparative economic systems, public finance, and government regulation of business; engineering and science students may be interested in courses in introduction to econometrics, and intermediate microeconomic analysis. Noneconomics majors with questions about the nature of various courses should feel free to question the economics faculty.

Economics majors must complete nine full courses in economics with a grade of at least C− (1.67) in each course and achieve at least a 2.00 grade-point average. These must include both intermediate theory courses, Econ 605 and 611, and Econ 525, Introduction to Economic Statistics. (Students may petition to substitute one 600- or higher-level administration or resource economics course for an economics elective.) Major credit toward Econ 605 and/or 611 will be awarded transfer students only if such courses have been taken at the junior level or above. Transfer students must take five of their nine economics courses at UNH. All economics majors must satisfy the bachelor of arts degree requirements (page 17).

A suggested plan for economics majors is given below:

Freshman and Sophomore Years

Econ 401, 402, Principles of Economics (Macro and Micro); Econ 525, Introduction to Economic Statistics

Junior Year

Econ 605, Intermediate Microeconomic Analysis; Econ 611, Intermediate Macroeconomic Analysis

Senior Year

Economics electives (4)

Minor A minor consists of five economics courses. A complete list of minor requirements is available in the Whittemore School Advising Center, room 120 McConnell Hall.

Hotel Administration

(For descriptions of courses, see page 152.)

The hotel administration program objective is to prepare students for management positions in the service sector and specifically in the hospitality industry. Graduates have accepted positions in lodging, food service, tourism, travel and recreation industries, and institutions such as hospitals, nursing homes, colleges, and schools.

In order to have a well-rounded university education, students take courses in liberal arts as well as foundation courses in business administration and economics. The hotel administration curriculum builds upon this foundation and provides experience and in-depth education in the lodging and food service industries.

The program includes a mix of practical experience along with classroom activities. These practical experiences are provided by major consulting projects to industry (as part of classroom projects); lecture series; seminars and field trips; a minimum of 400 hours approved work experience (practicum); and by the operation of a campus food service facility, catering services, and gourmet dinners.

The hotel administration program consists of 14 required courses in three groupings. Group A consists of 6 core courses taken in the freshman and sophomore years. Group B includes most of the functional areas required to develop successful management skills. These are generally taken in the junior and senior years. Group C includes Hospitality Marketing Management and a final capstone course, Hospitality Industry Business Policy. These are usually taken in the senior year. A wide range of elective independent studies and internships can complement the required curriculum.

Students must successfully complete Group A courses, achieving a minimum grade-point average of at least 2.00, before Group B courses may be taken. Group B courses must be completed before taking any Group C courses.

In order to graduate, students must obtain a 2.00 grade-point average in all major required courses. Graduates of this program who are qualified for and interested in further allied studies are well prepared for advanced degree programs in business or institutional administration.

A suggested plan of study is given below:

Freshman and Sophomore Years (Group A)

Econ 401, Principles of Economics (Macro); Econ 402, Principles of Economics (Micro); Hotl 403, Food and Beverage Management; Hotl 556, Lodging and Physical Structures Management; Admn 424, Business Statistics; Admn 502, Financial Accounting.

Junior and Senior Years (Group B)

Hotl 618, Financial Analysis and Control; Hotl 655, Hotel Development; Hotl 667, Advanced Food and Beverage Management; Admn 611, Behavior in Organizations; Admn 651, Marketing; Admn 653, Financial Management.

Senior Year (Group C)

Hotl 700, Hospitality Marketing Management; Hotl 703, Hospitality Industry Business Policy.

Secretarial Studies

(For descriptions of courses, see page 191.)

The Whittemore School also offers courses in secretarial studies, including introductory and advanced typing and shorthand, for all students in the University.

Preprofessional Programs

Prelaw

The Prelaw Committee of the University of New Hampshire recommends consideration of the following description of prelegal education excerpted from the *Prelaw Handbook* of the Association of American Law Schools.

Law schools are vitally concerned with the quality of preparation that students bring from their undergraduate experiences. For unless that preparation has been of high quality, the law schools cannot equip them for satisfactory performance within the legal profession and the democratic community.

The Association's responsibility in matters of prelegal education cannot best be met by prescribing certain courses and extracurricular activities for students planning to study law. The wide range of a lawyer's tasks opens a correspondingly wide range for choice of relevant prelaw preparation. So-called "law" courses in undergraduate instruction should not be taken for the purpose of learning the "law." They are not likely to be effective as education for lawyers, although they can be very helpful for teaching students "about law" and quite possibly for helping students estimate whether they might be interested in law study.

But while it considers the prescription of particular courses unwise, the Association can call attention to the quality of undergraduate instruction it believes fundamental to the later attainment of legal competence. That quality of education is concerned with the development in prelaw students of basic skills and insights. It thus involves education for:

Comprehension and Expression in Words Language is the lawyer's working tool. He or she must be able, in the drafting of legal instruments, to convey meaning clearly and effectively. In oral and written advocacy he or she must be capable of communicating ideas convincingly and concisely. In reception no less than in expression, language is fundamental as the lawyer's medium of communication. For the lawyer must be able to grasp the exact meaning of factual statements and legal instruments, to catch the fine points of legal reasoning and argument, and to comprehend the technical materials that constitute the body of the law. To acquire sufficient capacity for communication calls for extensive practice in all phases of the art. Truly, the legally trained man or woman must be precise in the use of the English language.

Critical Understanding of Human Institutions and Values The purpose is to develop insight into, rather than merely information about, institutions and values: human nature and the physical world; the economic systems of societies; the democratic processes in western societies; the social structures of societies; the cultural heritage of western societies, including philosophy and ethics.

Creative Power in Thinking The purpose is to develop power to think clearly, carefully, and independently. A large part of the work legally trained people are called upon to do calls for problem solving and sound judgment. Creative power in thinking requires the development of skills in: research, fact-completeness, marshaling and differentiation of facts, deductive and inductive reasoning, reasoning by analogy, critical analysis, constructive synthesis, and power of decision.

For additional information, please contact a member of the Prelaw Committee: Professor Richard Desrosiers, Department of Spanish and Classics, Murkland Hall, (603)862-3132; Professor William Jones, Department of History, Horton Social Science Center, (603)862-3025; Professor John Kayser, Department of Political Science, Horton Social Science Center, (603)862-1699; or Professor Ann Morgan, Department of Leisure Management and Tourism, Hewitt Hall, (603)862-2711.

Preprofessional Health Advisory Committee

Students preparing for careers in medicine, dentistry, optometry, osteopathy, podiatry, pharmacy, and physician assistant programs should become familiar with the minimum course requirements in their respective fields of interest as early as possible in order to incorporate the required courses into their college programs. There is no preprofessional major with a rigidly prescribed curriculum; rather, it is the acknowledgement of a student's professional intentions. Students are encouraged to major in subjects of their choice, either in sciences or nonsciences. In the past few years there has been a trend, particularly in premedicine and predentistry, away from exclusive concentration in a single area of science. Successful applicants from UNH have majored not only in sciences such as zoology, microbiology, biochemistry, and chemistry but also English, history, languages, psychology, and political science.

Students are assigned an appropriate faculty adviser from the department or school of their chosen major. The responsibility of the Preprofessional Health Advisory Committee is to offer information about specific admissions requirements and procedures to the professional schools desired and to provide recommendations at the time of application.

All medical and dental schools expect applicants to have demonstrated ability in basic natural and physical sciences. Although the specific requirements for admission vary considerably, the following courses constitute a minimum for students to be considered for admissions: biological sciences, physics, general chemistry, and organic chemistry—all two semesters each with laboratory; calculus is also recommended. A year of English, preferably composition, is required. An appropriate group of courses from among the offerings at the University of New Hampshire would be the following: Zool 412, 518, 730; Phys 401-402; Chem 403-404, 651-652, 653-654; and Math 425-426. One semester of general psychology is also required by some dental schools.

Courses which qualify individuals for consideration as premedical, predental, or other preprofessional students should be completed by the time application to a professional school is submitted, usually by the end of the junior year. Inasmuch as performance in these courses is weighted heavily by the admissions committees, it is strongly recommended that students not register for them under the pass/fail grading alternative.

The following schedule is suggested for timing applications to medical and dental schools:

1. Students should apply to schools of their choice in the summer after their junior year if they wish acceptance following graduation. However, a delay of a year or more to complete courses or to work is neither detrimental nor unusual for acceptance into medical or dental school. Though the application services accept applications from June through December, early applications are often advantageous.

2. The Medical College Admissions Test (MCAT) or the Dental Admission Test (DAT) must be taken before or at the time of application to medical or dental schools. The MCAT and DAT exams are preferably taken in the spring of the student's junior year (if the student is applying as a senior).

3. Interested students should contact the Preprofessional Health Advisory Office early in their college careers and meet members of the advisory committee preceding their application to professional schools, since the letter of recommendation provided by the committee is an integral part of the admissions process. Visit the office or call 862-3625 for an appointment.

Among students from UNH who were accepted into medical and dental schools over the past five years, the competitive overall grade-point average was approximately 3.50 for medical school and 3.40 for dental school.

Interdisciplinary Programs

In addition to the general University interdisciplinary opportunities described in this section, other ways of combining studies are mentioned in the program information of the various colleges and schools. Some of the more specific opportunities are:

Biomedical engineering minor, page 54;
Community development, page 44;
Dual degrees, page 17;
Environmental conservation, page 45;
Environmental engineering minor, page 54;
Five-year B.A.–M.B.A. program, page 23;
Five-year B.S.–M.B.A. program, page 42; and page 53;
Forest resources, page 46;
General studies, page 47;
History and philosophy of science minor, page 25;
Humanities major, page 31;
Hydrology, page 54;
Independent study and projects in the College of Engineering and Physical Sciences, page 55;
Interdisciplinary mathematics (9 options), page 65;
International affairs, page 85;
Linguistics major, page 32;
Materials science minor, page 54;
Minors, page 18;
Ocean engineering minor, page 55;
Oceanography minor, page 55;
Plant pest management, page 41;
Religious studies minor, page 25;
Resource economics, page 48;
Second majors, page 18;
Soil science, page 49;
Student-designed majors, page 82;
Wildlife management, page 51;
Women's studies minor, page 26.

Student-Designed Majors

Under special circumstances, students may design their own majors. This option is offered for highly motivated and independently disciplined students who seek a course of study that is not available through existing programs at the University. It allows students, with the close supervision of faculty members, to cross department and college lines and to create educational experiences on and off campus as part of individual programs of study.

Student-designed majors are administered by a committee of elected faculty that operates through the Office of the Vice President for Academic Affairs. Students who want to design their own majors are expected to give the committee evidence of careful thought and planning in a detailed proposal submitted before the middle of their junior year. Proposal guidelines are available in the Office of the Vice President for Academic Affairs.

Intercollege Courses

Intercollege courses are listed on page 154. The Independent Work-Study courses are continuous offerings. Other Inco courses include Inco 401, Nuclear War; Inco 491, Computer Literacy; and Inco 685, 686, Study Abroad.

Interdepartmental Biology Major

(For course descriptions, see page 106.)

The interdepartmental biology major is designed with a common core curriculum from which programs of study are available for: 1) preparation for teaching biology in secondary schools; and 2) preparation for professional careers in biology or graduate study. Completion of the four-year undergraduate program plus a fifth-year internship will be necessary for biology teacher certification.

Students are advised to declare the biology major as incoming freshmen to assure adequate program planning. The major is offered in both the College of Liberal Arts and the College of Life Sciences and Agriculture. Students who wish a less specialized program or who do not plan to teach secondary school should consider a major in animal sciences, biochemistry, botany, entomology, microbiology, plant science, or zoology.

Major and supporting courses in the following list should be taken in the sequence given. Students planning to teach should enroll in Educ 500 during their sophomore year and should consult with the

Department of Education on further courses in that field. Those not planning to teach will instead take three advanced biological science or supporting courses. Graduation requirements include a 2.00 cumulative grade-point average in the courses prescribed in the major. A grade of C− (1.67) or better is required in 11 biological science courses. Students majoring in one of the biological science departments may not minor in biology.

Students interested in the biology major should contact James A. Stewart, Coordinator of the Biology Program; or Robert Blanchard if they are in the College of Life Sciences and Agriculture; or Edward Francq if they are in the College of Liberal Arts.

Major Course Sequence Note: Except for science courses, University General Education Requirements are not included. (See General Education Requirements, page 15.)

Freshman Year

Bot 412, Zool 412, Chem 403-404, Math 425

Sophomore Year

Chem 545, Zool 518, Zool 519, Biol 541, Educ 500*, Bot 566

Junior Year

Phys 401-402, Bot or PlSc 606, Micr 503, education*, advanced biology, or supporting courses†

Senior Year

Ento 402, Zool or PlSc 604, a 700-level botany course, education*, advanced biology, or supporting courses†

*For teacher preparation, consult the Department of Education.

†For nonteacher preparation, substitution of Chem 651-652 for Chem 545 early in the program, and the second semester of calculus, are suggested for graduate school preparation.

General Science Certification Students majoring in biology may seek certification to teach science at the middle or junior high school level. (See Preparing for Teaching, page 23.)

Genetics

An undergraduate degree in genetics is not offered at the University of New Hampshire. In the Graduate School, the M.S. and Ph.D. degrees are offered in an interdepartmental genetics program, involving the departments of animal sciences, biochemistry, botany and plant pathology, forestry resources, microbiology, plant science, and zoology. For some of the courses offered in the program, see the Genetics entry in the course descriptions of this catalog as well as other genetics courses offered by the cooperating departments within the genetics program. Students interested in preparing for graduate work in genetics at UNH or elsewhere should contact the chairperson of the genetics program early in their undergraduate careers for advice on courses.

Gerontology

The gerontology minor provides an interdisciplinary focus on aging in American society. The courses provide an understanding of development of humans as they age biologically, socially, and physically. In addition, societal response to aging people is analyzed in terms of policies and programs. Applications of this knowledge in social and physical practice is an integral part of the learning experience.

Gerontology minors are required to take a minimum of 20 credits (five courses). The courses must include three core gerontology courses plus two electives from a list of courses approved by the Interdisciplinary Minor Advisory Committee. The required core courses are:

Gero 600, Introduction to Gerontology
Gero 670, Issues in Health Care of the Aged (Also listed as Nursing 670)
Gero 795, Independent Study (A practicum arranged by the coordinator of minor, or by the appropriate designee)

Approved electives are:

S S 525, Introduction to Social Welfare Policy: Provisions
S S 550, Human Behavior and Social Environment I
S S 700, Social Gerontology
S S 701, Women and Aging
FCS 525, Human Development
FCS 743, Parents, Children, and Professionals
Nurs 535, Death and Dying
O T 600, Developmental Tasks of Adulthood
Soc 635, Medical Sociology: Organization and Processes of Modern Medicine

Other courses that may be offered on special topics may serve to complete the electives if approval is obtained from the advisory committee.

Students who wish to minor in gerontology should consult with the coordinator, Juliette D. Petillo, Elizabeth DeMeritt House, 862-2260.

Nutritional Sciences

(For course descriptions, see page 170.)

Students interested in careers in the nutritional sciences complete a core of basic courses in the biological and physical sciences while taking specialized courses in nutrition. The core requirements are in chemistry, zoology, English, biochemistry, and nutritional sciences. See Nutritional Sciences, page 47.

Marine Sciences

Introduction (Resources and Facilities) Undergraduate programs in marine science and ocean engineering at the University of New Hampshire reflect the diversity of the ocean itself and are enriched by easy access to a variety of natural laboratories, ranging from freshwater lakes to open ocean.

Studies in marine science and ocean engineering draw upon faculty from every school and college within the University. Students identify the discipline they like best, ranging from mechanical engineering to zoology, and pursue marine specializations related to that area of study.

Marine studies at UNH are enlivened by a variety of natural laboratories near the campus. Durham is located on the banks of a tidal river and borders the Great Bay estuarine system. Minutes away, New Hampshire's stretch of coastline encompasses study sites at sandy beaches, salt marshes, dune systems, and rocky shores. The Isles of Shoals, a few miles offshore, provide an environment undisturbed by development. Students and faculty routinely pursue studies in all these environments.

The Marine Program Building provides a focus for marine activities on campus, with specialized laboratory facilities located in individual departments and organized research units. A $15 million research building, which will house several of the marine-related research programs, is now under construction. Estuarine research is pursued at the Jackson Estuarine Laboratory on Great Bay. A major running-seawater field station will soon be completed on the ocean in nearby New Castle. At the Diamond Island research facility on Lake Winnipesaukee, UNH engineers test marine technology such as the latest generation of free-swimming underwater robots. The 45-foot research vessel *Jere A. Chase* has docking facilities at the Jackson Lab and at the State Fish Pier in Portsmouth Harbor. Summer finds many students living and studying on Appledore Island, one of the Isles of Shoals, where UNH and Cornell University cooperatively run a seasonal laboratory focusing on marine biology and related subjects.

Specialized equipment includes a circulating seawater system at the Jackson Lab, electron microscopes, main-frame and microcomputers, a Beckman automatic amino acid analyzer, a liquid scintillation counter, a mass spectrometer, an autoanalyzer, spectrophotometers, wave tanks, and diving equipment. The *R/V Jere A. Chase* is equipped with radios, radar, Loran, an A-frame, and portable research tools.

Disciplines There is no separate undergraduate major in the marine sciences or oceanography, but faculty in every school and college contribute to marine education. Students may choose marine-related options or minors in the departments of biochemistry, botany, chemical engineering, chemistry, civil engineering, earth sciences, electrical and computer engineering, mechanical engineering, microbiology, and zoology. Also offering courses that broaden students' understanding of marine issues are the Whittemore School of Business and Economics and the departments of animal and nutritional sciences, computer science, forest resources, mathematics, physical education, physics, political science, and resource economics and community development. Intensive field, laboratory, and lecture courses are offered in the summer at the Shoals Marine Laboratory.

The Ocean Projects Course, an interdisciplinary offering, encourages students from different departments to form project teams to work on a wide variety of marine-related problems in engineering, natural and social sciences, and humanities.

Most marine careers require a strong foundation in one or more of the basic sciences—biology, chemistry, physics, and mathematics—and it is recommended that students acquire a bachelor's degree in one of these traditional disciplines. While there is no separate undergraduate major in marine sciences or oceanography, minors in oceanography and ocean engineering are offered. (See page 55.)

Curricula in the Marine Sciences Students should declare a major in one of the established science disciplines most closely allied to their principal area of interest. An adviser in the department will help students select additional courses.

If interested in chemical, geological, or physical oceanography, consult the chairperson of the Department of Earth Sciences. If your interest is in the area of biological oceanography or marine biology, consult the chairpersons of the departments of botany and plant pathology, microbiology, or zoology. If you are interested in marine policy (political, economic, and legal), consult with the chairperson of the Department of Political Science.

Shoals Marine Laboratory The University of New Hampshire, in cooperation with Cornell University, offers a summer field program in marine sciences on Appledore Island at the Isles of Shoals. Courses are designed to introduce undergraduates to a broad array of marine sciences, including oceanography, marine biology, fisheries, and marine resources. The four-week, six-credit general course, Field Marine Science, is offered in June and August of each summer. It draws upon the backgrounds of more than fifteen faculty and many others, including captains, fishermen, and others whose living is associated with the sea. At least one full year of college biology or the equivalent is a prerequisite. Daily lectures and work in laboratory and field are offered; the course is graded on a letter grade basis. For further information, contact Arthur C. Borror (associate director of the Shoals Marine Laboratory), Zoology Department, Room 203, Spaulding Life Sciences Building, University of New Hampshire.

Diving Program The UNH diving program offers instruction in scuba diving, research diving techniques, and underwater photography. It provides professional diving support for underwater research. The Shoals Marine Laboratory offers courses in marine archaeology and underwater research during the summer, under the guidelines of UNH diving regulations.

Research There are many opportunities for undergraduates to become involved in the more than $2.5 million worth of funded marine research involving UNH faculty.

The University of New Hampshire and the University of Maine at Orono have a joint Sea Grant College Program that supports research, teaching, and service projects through the National Oceanic and Atmospheric Administration of the Department of Commerce. Marine projects also receive support through the National Science Foundation, the Department of the Interior, the Office of Naval Research, and other foundations and private donors.

Extensive research, interdisciplinary academic programs, and the extraordinary variety of marine environments and facilities provide windows for students to observe and learn about the frontiers of science and technology being explored in the ocean. For information in general about marine opportunities, contact the Marine Program Office, Marine Program Building.

Program for International Perspectives

(For course descriptions, see page 185.)

The Program for International Perspectives offers undergraduate students pursuing a B.A. or B.S. in any major the opportunity to take a dual major in International Affairs. The purpose of the dual major is to enlarge student horizons to international dimensions, enhance knowledge of their primary majors, and expand their career opportunities into the international arena. The dual major entails

three required courses:
- International Perspectives: Science, Business, and Politics (Fall)
- North-South Issues in International Affairs (Spring)
- Seminar in International Affairs (Spring)

foreign experience
proficiency in a foreign language
one elective from each of the Program's four elective groups:
- foreign areas
- science, technology, and the private sector
- public policy
- theory in international studies

Before taking the required seminar, students will spend a period abroad in an academic institution; serve an internship abroad with a public or private organization; or arrange purposeful travel abroad in order to acquire the knowledge, skills, and experience that come from residence in a foreign culture. These experiences are essential to understanding international affairs.

For information, contact the Center for International Perspectives, New England Center Administration Building, 862-2398.

Field Experience Program

The field experience program integrates theoretical classroom study with planned and supervised practical experience. The program operates in three different patterns: full-time employment during half of the academic year, alternating a semester in class with a semester of work; part-time employment and part-time classwork during the whole academic year; and full-time employment during the summer.

Participating students are placed in off-campus positions that are related to their curricula, and these positions are of sufficient quality to provide learning experiences. The students not only strengthen their academic knowledge through practical experience but also gain greater career awareness and understanding of the business environment.

Students from the following colleges, departments, and programs may participate: College of Engineering and Physical Sciences, Whittemore School of Business and Economics, College of Liberal Arts (art history, French, geography, German and Russian, history, humanities, microbiology, political science, psychology, sociology and anthropology, Spanish and classics, theater and communication, zoology), College of Life Sciences and Agriculture (animal and nutritional sciences, biochemistry, botany and plant pathology, entomology, family and consumer studies, forest resources, plant science, and resource economics and community development); career concentration minors; Associate in Arts degree; and the Graduate School.

Students may earn elective credits toward graduation by registering for the appropriate DCE Field Experience course. In some cases, students participating full time in a Field Experience project may retain their full-time enrollment status. Interested students should contact the Field Experience Program, Division of Continuing Education, Verrette House.

Reserve Officer Training Corps Programs

The Army and Air Force offer Reserve Officer Training Corps (ROTC) programs leading to a commission as a second lieutenant in their respective services. Both programs are open to men and women. Students in either ROTC program may pursue any University curriculum that leads to a baccalaureate or higher degree.

Two- and four-year programs are available. The four-year program is open to freshmen and to transfer students who began ROTC at another institution. In addition to on-campus ROTC course requirements, students must attend an officer preparatory training session for a part of one summer.

ROTC is open to all students pursuing a baccalaureate degree who have a minimum of two academic years or more remaining within their degree program. Entering freshmen may pre-register for Military Science 413 (AROTC) or Aerospace Studies 415 (AFROTC). Sophomores desiring to enter ROTC should check with either the Army or Air Force enrollment advisers located in Zais Hall.

Two-year ROTC programs are open to students who have two academic years of study remaining at the University. Applicants for the two-year program must attend a six-week training session during the summer immediately before their entry into ROTC.

ROTC scholarships are offered on a competitive basis by both the Army and Air Force. Entering freshmen may compete for four-year scholarships during the last year of high school. Students in a four-year ROTC program and two-year program applicants compete for scholarships covering their remaining academic years. Scholarships pay for full tuition, all mandatory University fees, and required textbooks for all courses. In addition, all scholarship recipients receive a tax-free $100-per-month subsistence allowance. Nonscholarship students in the last two years of an ROTC program also receive

the tax-free $100-per-month subsistence allowance.

Students in Air Force ROTC are required to take a math reasoning course from a list approved by the professor of aerospace studies as part of their curriculum.

More specific information about ROTC programs may be obtained by contacting the professor of military science (Army ROTC) or of aerospace studies (Air Force ROTC).

Off-Campus Programs

Consortium (NHCUC) Student Exchange Program

Under the Student Exchange Program of the New Hampshire College and University Council (NHCUC), UNH students may be eligible to enroll for: one or two courses, one semester of courses, or a full year of coursework at a member school, on a space-available basis. The purpose of the consortium exchange is to allow matriculated undergraduates to use educational resources that are not available at the home campus and are considered appropriate for their degree programs. The consortium exchange will be used only when academic reasons or other special circumstances warrant it. Approval of the UNH adviser and college dean is required. Schools in the NHCUC consortium include: Colby-Sawyer College, Daniel Webster College, Franklin Pierce College, Nathaniel Hawthorne College, New England College and its Arundel Branch in England (limited enrollment), New Hampshire College, Notre Dame College, Rivier College, St. Anselm College, UNH, Keene State College, and Plymouth State College. Students will remain as degree candidates and continue to pay normal UNH tuition and fees but must make their own room and board arrangements if they plan to spend a full semester at another consortium school. For more information and application forms, students should contact Carolyn Tacy, exchange coordinator, Dean of Students Office, Huddleston Hall.

UNH/UNHM Cross Registration

Matriculated students at the University of New Hampshire and the University of New Hampshire at Manchester may take UNH courses at either location. Students must have permission of their academic advisers and must register for the courses on a space-available basis. For more information and special registration forms, students should contact James Wolf, Assistant Registrar, Thompson Hall, or Peter Haebler, Assistant Dean for Academic Services, UNHM.

Foreign Study Programs

The University offers opportunities for students to study in some foreign institutions. For more information, the student should contact one of the foreign language departments in Murkland Hall.

New England Subdegree Exchange Program

In order to provide students at the New England land-grant universities with expanded access to unique programs and faculty expertise, the institutions have agreed to encourage student exchanges of one but not more rhan two semesters. To qualify, a student must: identify a course or combination of courses related to the student's area of academic interest and not available on his/her home campus, be a degree candidate in good standing with at least a 2.50 grade-point average, be at least a first-semester sophomore, and receive permission from the appropriate university exchange authorities at both the sending and receiving institutions. Interested students should contact Carolyn Tacy at the Dean of Students Office, Huddleston Hall.

UNH/USA Exchange Program

The University offers one-semester or full-year exchange programs with San Diego State University and the University of California, Santa Cruz. To qualify, a student must be a full-time degree candidate with at least a 2.50 grade-point average, be at least a first-semester sophomore but no more than a first-semester senior, have declared a major, receive permission from his/her college dean and adviser, and receive permission from the exchange authorities.

The concept underlying the program is that of an educational experience in a different environment within the United States. The intent is that the students should receive the fullest experience of the new university that is possible. It is hoped that the student will develop new ways of viewing the world and expand his/her conception of our complex society.

The Exchange Program facilitates the continuity of the student's educational process through a unique policy whereby the student continues to maintain his or her status as a UNH student, even while temporarily located at another university. An important feature of this policy is that the student does not have to withdraw from school and later be readmitted. Maintaining UNH student status also facilitates reentry into classes, dormitories, and many other dimensions of University living upon the student's return.

The Exchange Program intends that the student return to UNH to continue or complete studies. In essence, this program offers students the opportunity to experience another university as a part of their UNH education. Interested students should contact Carolyn Tacy in the Dean of Students Office, Huddleston Hall.

New England/Quebec Student Exchange Program

Students may spend their sophomore or junior year at one of several French- or English-speaking universities in the province of Quebec, including McGill University and the Université de Montréal. Eligibility requirements include a command of the language of the host campus, U.S. citizenship, sophomore or junior standing, and excellent academic record. Contact Carolyn Tacy in the Dean of Students Office, Huddleston Hall for further information.

Associate in Arts Degree

The associate in arts degree gives students an opportunity to obtain a general, two-year college education, elect career-training coursework in several fields, and earn college credits in supervised work experience with cooperating employers.

The University has designed the program to be equally accessible to both full- and part-time students and, in doing so, assures that a wide range of University credit courses would be available both during the late afternoon and early evening hours and during the daytime. Special procedures have been designed to simplify admission and registration for part-time evening students.

For full-time A.A. students, cooperative field work can mean alternating semesters of full-time study and full-time employment (with pay) in one of several careers. For part-time students, it can mean an opportunity for new on-the-job experiences for college credit. Each field experience is arranged by a coordinator on an individual basis.

The degree can be complete in itself, or it can be a halfway mark toward a bachelor's degree. Credits earned as an A.A. degree candidate are transferable into related bachelor's degree programs at UNH and other colleges and universities.

Career Concentrations

Within the associate in arts degree program, students may elect courses in one or more of the following concentrations:

Accounting A career in accounting offers attractive employment opportunities to individuals who have completed this program. Changing government regulations and a fluctuating economy have created the demand for an increasing number of qualified accountants and auditors in contemporary business, industry, and service.

Graduates should be qualified for a wide range of positions in accounting—ranging from management of entire bookkeeping systems in small companies to work in larger organizations, under supervision of a certified public accountant.

Required accounting courses: DCE 462-463, 561, 562; Econ 402; C S 406.

Computer Information Studies A career in computer information offers excellent opportunities for advancement and professional growth for individuals with appropriate training. Because computer information specialists are essential in today's technological, information-oriented society, qualified men and women will be in constant demand. Long-range employment forecasts predict solid, continuing growth well into the next decade.

This career concentration trains individuals for such entry-level positions as data analyst, applications technician, programmer, and computer operations supervisor. Graduates should be qualified to work on projects that involve equipment ranging from personal computers to large-scale hardware.

Required computer information studies courses: C S 410 and 410C; or C S 406; DCE 490, 590, 591, and 592; Math 420.

Criminal Justice Careers in criminal justice are among the most challenging occupations. Careers in criminal justice extend beyond the "police beat" and include, for example, positions in various agencies of law enforcement at the municipal, county, state, and federal levels of government, and in private industry. Required criminal justice courses: DCE 550, 551, and 552, and a choice of one from DCE 554, Polt 507, or Soc 615.

Management A career in management offers unlimited opportunities for personal and professional growth to individuals with appropriate training. Because the success or failure of any enterprise is directly related to the competence of its administrators, there will always be a demand for men and women with skills in the conceptual, analytical, and applied aspects of management.

Graduates in management find employment in business, government, private industry, human services, and an infinite variety of organizations in contemporary society.

The program in management emphasizes the development of skills needed in administrative and supervisory functions.

Required management courses: DCE 430, 431, 432; Econ 402; and at least two courses from DCE 411, 532, 534, and 535.

Merchandising Careers in merchandising represent a significant segment of New Hampshire's economy, and many functions within the field require specific knowledge and skills. The career-training coursework in merchandising begins with the fundamentals and expands to specific techniques in promotion and advertising, retailing, and credit management. Employment opportunities exist not only in large industries but also in department stores, retail operations, discount stores, supermarkets, mail order operations, and smaller variety stores in the resort areas. Required merchandising courses: DCE 410, 411, 510, and either 512 or 531.

Pre-Engineering and Physical Sciences Adults who desire a University degree in engineering or the physical sciences may enroll on a full-time or part-time basis through the associate in arts degree program.

This program satisfies first-year course requirements of most bachelor of science programs in engineering and physical sciences. For further information, see separate Pre-Engineering Bulletin.

Required courses: Math 425-426; Physics 407-408; Chem 403-404.

Real Estate The career-training coursework in the real estate concentration can help students who wish to qualify for a state license. A.A. graduates who concentrate on the real estate concentration may often find a higher-level job entry and increased promotional opportunities with both large and small real estate firms. Supplemented with elective courses in management, this concentration can

also offer a solid educational background for individuals planning to establish businesses. Required real estate courses: DCE 425, 426, 525, and 526.

Admission Requirements

For the associate in arts degree program, candidates must have a high school diploma or an equivalency certificate and should have demonstrated ability and motivation through secondary school achievement, work experience, and/or military service. Because of the present limited residence hall capacity of the University, this program is available only to commuting students.

Graduates of associate in arts programs are awarded a minimum of 64 credit hours upon entry into a UNH bachelor's degree program. Degree candidates wishing to continue their studies should consult with their advisers to ensure that their planned programs meet the specific requirements for the selected major at the institution awarding the bachelor's degree.

The associate in arts degree program is offered on a full-time and a part-time basis. Students interested in the part-time evening A.A. degree option should obtain an application form from the Division of Continuing Education. Students interested in a full-time or daytime A.A. degree program should obtain the application form from the UNH Admissions Office.

Degree Requirements

For degree requirements, see page 17.

Academic Regulations

Associate in arts degree candidates are subject to the academic requirements established by the University.

Pass/Fail Associate in arts degree candidates, after completion of a minimum of 16 credits at the University of New Hampshire on a regular graded basis of A to F, may use the pass/fail grading alternative in a maximum of two elective four-credit courses. The pass/fail grading alternative may be used for a maximum of four credits per semester. No pass/fail grading alternative may be used in fulfillment of University General Education Requirements or for courses in students' declared career concentrations. The minimum passing grade for credit is a D– (0.67).

Advising

Program planning and other advising services are provided by the professional staff of the Division of Continuing Education. Academic advisers are available from 8 a.m. to 4:30 p.m. daily and during evening hours on an appointment basis.

Financial Aid

Associate in arts degree candidates are eligible for the full range of financial aid offered by the University. See the Financial Aid section of this catalog.

For More Information

For further information about programs or services, write or visit the Division of Continuing Education, Office of Academic Advising, Verrette House, UNH, Durham, N.H. 03824 (603) 862-1548.

Thompson School of Applied Science

John A. Leahy, Jr., Interim Director

The mission of the Thompson School of Applied Science (TSAS) is to offer two-year, technical-level programs leading to an associate in applied science degree. A "learning-by-doing" educational approach prepares graduates for employment as technicians, professional assistants, supervisors, and mid-management personnel in industry, organizations, and agencies.

Programs currently offered include: 1) Applied Animal Science, 2) Applied Business Management, 3) Civil Technology, 4) Food Services Management (and Culinary Arts), 5) Forest Technology, and 6) Horticultural Technology.

Thompson School graduates acquire necessary skills and experience to seek satisfactory employment at the end of two years; they also have the option to continue their education at the baccalaureate level.

Thompson School students are eligible for on-campus housing.

Admission Requirements

Applicants to the Thompson School of Applied Science are considered on the basis of secondary school course selections, academic achievement, class rank, and school recommendations. The secondary school program need not be college preparatory. Rather, emphasis is placed on applicants' motivation and demonstrated interest in their career fields.

All candidates graduating from high school must submit the results of the College Entrance Examination Board Scholastic Aptitude Test. Applicants to the forest and civil technology programs must also have completed two years of satisfactory work in college preparatory mathematics.

Financial Aid

Associate in applied science degree candidates are eligible for the full range of financial aid offered by the University. See the Financial Aid section of the Thompson School catalog.

Advising

Program planning and other advising services are provided by the faculty and professional staff of the Thompson School. Academic advisers are available during office hours or on an appointment basis.

Transfer Policy

Many colleges accept Thompson School graduates at the junior-year level. Others, including most UNH baccalaureate programs, generally accept Thompson School graduates as second-semester sophomores.

The University awards partial credit transfer for TSAS course work. Students who seek to continue their education in the University's baccalaureate degree programs are advised that transfer consideration is based on an applicant's level of achievement and on the availability of spaces in the baccalaureate programs. Students with an academic average of 2.80 or higher at the end of the freshman year, or 2.50 or higher at the end of the senior year, may be eligible for transfer.

Four-hundred-plus numbered courses taken by a TSAS student will be incorporated into the cumulative grade-point average upon the student's matriculation in an associate in arts or bachelor's degree program. It applies whether or not the former TSAS student actually received the A.A.S. degree. Students may not petition to selectively include in or exclude from their associate in arts or bachelor's degree grade-point average any 400-plus numbered courses that were taken during the A.A.S. degree program. Interested students should check with their advisers concerning transfer.

For More Information

For a Thompson School Catalog and/or more specific information, write or call the director, Thompson School of Applied Science, Barton Hall, Durham, N.H. 03824 (603) 862-1025.

University of New Hampshire at Manchester

Lewis Roberts, Jr., Dean
Paul A. Dubois, Associate Dean

The University of New Hampshire at Manchester (formerly Merrimack Valley College) was established in 1985 to provide new learning opportunities for people who live and work in central New Hampshire. The newest college of the University offers associate degrees, access to other UNH degree programs, special courses, workshops, seminars, and cultural events for the region.

Degree Programs

Students can pursue UNH associate in arts or associate in science degree programs full or part time with a choice of concentrations. Those students who complete requirements for an associate degree in Manchester with a specified minimum grade-point average and who are recommended by their academic advisers earn the right to continue toward a bachelor's degree at the University in Durham.

Selected degrees from other colleges of the University System of New Hampshire are also available through the University of New Hampshire at Manchester.

For More Information

To receive a UNHM Bulletin and more specific information on UNHM courses, contact the University of New Hampshire at Manchester, 220 Hackett Hill Road, Manchester, N.H. 03102 (phone: 603-668-0700).

Division of Continuing Education and Summer Session

Continuing Education

Edward J. Durnall, Director
Paul A. Dubois, Associate Director

The Division of Continuing Education (DCE) provides access to higher education for New Hampshire residents under conditions that permit individuals to participate in University programs appropriate to their changing educational needs. These needs may at times be best satisfied through participation in workshops, seminars, short courses, or certificate programs—at other times by enrollment in credit courses and degree programs.

The faculty of the Division of Continuing Education is drawn from the teaching staffs of the University, from the faculties of neighboring colleges and universities, and from business, professional, and community leaders.

In addition to the programs listed below, it is possible to complete many of the degree requirements in other areas of study offered by the University through enrollment in credit courses scheduled by DCE each semester.

Associate in Arts Degree

(See page 17. For descriptions of courses, see page 117.)

Special Student Status

Special students—those who are not formally admitted into a degree program at the University of New Hampshire—may enroll in University credit courses each semester through the Division of Continuing Education.

All special undergraduate students are limited to 11 credits per term unless they obtain written permission from the director of admissions, Thompson Hall. Special graduate students are also subject to enrollment limitations. Contact the Division of Continuing Education for details.

Undergraduate Courses Special students must have a high school diploma or its equivalent or be at least 18 years of age.

Graduate Courses Special students must hold a bachelor's degree or equivalent from an approved college or university.

Prerequisites All students are responsible for satisfying course prerequisites, if any. Instructors may require students to withdraw from a course if they are not adequately prepared for the level of work.

Academic Standards A cumulative grade-point average of 2.00 (C grade) is the minimum acceptable level for undergraduate work in the University. The Division of Continuing Education Executive Committee examines the records of special undergraduate students periodically and may warn academically deficient or potentially deficient students, or may exclude or suspend those who are academically deficient.

Diploma Programs

To meet the need for University-quality, short-term, career-related programs for adults, the division has developed career concentration diplomas in accounting, computer information studies, criminal justice, documentation specialist, management, merchandising, and real estate.

Each diploma program consists of four or five credit courses which concentrate on a specific career area. These required courses can normally be completed in two or four semesters of part-time study. Upon successful completion of the required courses, students will be awarded a diploma from the Division of Continuing Education, and the students will have a permanent record of their achievements on file with the University.

For application forms and further information, contact DCE Academic Advising, 6 Garrison Avenue, 862-1548.

Noncredit Courses

Throughout the year, DCE offers noncredit courses to the community. These courses provide opportunities for individual growth or continuing education for groups and individuals in business, labor, education, government, or the professions.

Professional and career development noncredit courses typically meet one evening a week for about 10 weeks, depending on course objectives. Examples include paralegal studies, business writing, information systems, graphic arts, interior design, skills for teaching, and labor-management relations.

Personal enrichment courses are offered during the day and evening, during the week, and on weekends. Examples include physical fitness and recreation, parent-child communication, arts and crafts, local history, current events, personal financial planning, creative writing, and photography.

Noncredit Certificate Programs

Certificate programs consist of specifically developed sequences of courses that provide a sound balance of theory, fundamentals, and specialized training. Certificates of achievement awarded by the Division of Continuing Education have earned professional acceptance as evidence of increased knowledge in basic principles and techniques.

Noncredit certificate programs include interior design, graphic arts, gerontology, applied farm technology, calligraphy, illustration, and paralegal studies.

Conferences and Workshops

The division also conducts institutes, workshops, and seminars, which range from half-day briefings on specific topics to residential institutes lasting several days or weeks. Such programs are offered on topics of community interest and for the continuing education of business, industry, government, and the professions.

The division uses the facilities of the entire University campus for its programs, as well as the New

England Center for Continuing Education (adjacent to the UNH campus) and nearby commercial establishments.

Course Charges

Students who enroll in credit courses through the Division of Continuing Education pay on a per-credit basis, depending on course level. These course charges are listed in the DCE Bulletin published before each semester. The course charges for noncredit courses and for conferences, workshops, and institutes vary according to the scope of the individual programs.

Class Schedule

While students may enroll in morning and afternoon classes through the division, many courses offered each semester are scheduled in the late afternoon and early evening to accommodate evening students.

All courses offered by the University each semester are open to special students on a space-available basis.

Division Publications

Specific information on course offerings, registration procedures, and academic requirements can be found in individual publications describing each program. For more information, write: Division of Continuing Education, 6 Garrison Avenue, UNH, Durham, N.H. 03824 (603) 862-2015.

Summer Session

Edward J. Durnall, Director

The University of New Hampshire offers students the opportunity to continue their studies on a year-round basis through four-, six-, and eight-week sessions during the summer months. The summer courses are of the same high quality as those during the regular academic year and require the same level of academic performance.

Summer Session offerings include a full range of undergraduate and graduate credit courses in most of the major academic disciplines. Throughout the summer, classes are scheduled in the morning, afternoon, and evening.

Enrollment in Summer Session classes does not imply admission to degree candidacy.

Undergraduate Courses

Undergraduate courses are open to college undergraduates, to interested members of the community who have a high school diploma or its equivalent or who are at least 18 years of age, and to high school students completing their junior or senior year (by permission of the director).

Graduate Courses

Graduate courses are open to graduate students and other individuals with a bachelor's degree or its equivalent from an approved college or university.

Other Offerings

Other Summer Session offerings include noncredit courses and certificate programs; workshops and seminars for business, industry, and the professions; and residential conferences and academic programs.

For More Information

A separate summer bulletin is published each year in March and is available from: Division of Continuing Education, 6 Garrison Avenue, University of New Hampshire, Durham, N.H. 03824 (603) 862-2015.

Graduate School

Raymond L. Erickson, Dean
William H. Drew, Associate Dean
Harry J. Richards, Assistant Dean

Master of Arts
Counseling
Economics
English
  Literature
  Language and Linguistics
  Writing
History
Music
Political Science
Psychology
Sociology
Spanish

Master of Science
Animal and Nutritional Sciences
Biochemistry
Biology
Botany
Chemical Engineering
Chemistry
Civil Engineering
Communication Disorders
Computer Science
Earth Sciences
  Geology
  Oceanography
Electrical Engineering
Entomology
Family and Consumer Studies
Forest Resources
Genetics
Hydrology
Mathematics
Mechanical Engineering
Microbiology
Music Education
Nursing
Ocean Engineering
Physical Education
Physics
Plant Science
Resource Administration and
  Management
Resource Economics
Soil Science
Wildlife
Zoology

Master of Arts in Teaching
Elementary Education
Secondary Education

Master of Science for Teachers
Chemistry
English
Mathematics
Physics

Master of Education
Administration and Supervision
Counseling
Developmental Disabilities
Early Childhood Education
  Special Needs
Elementary Education
Reading
Secondary Education

Master of Occupational Education

Master of Business Administration

Master of Public Administration

Certificate of Advanced Graduate Study
Counseling
Educational Administration and
  Supervision

Doctor of Philosophy
Animal and Nutritional Sciences
Biochemistry
Botany
Chemistry
Earth Sciences
  Geology
  Oceanography
Economics
  Organizational Behavior/Labor
Engineering
English
Genetics
History
Mathematics
Mathematics Education
Microbiology
Physics
Plant Science
Psychology
Reading/Writing Instruction
Sociology
Zoology

Graduate School

The Graduate School offers a wide range of programs leading to the master's degree, two programs leading to the C.A.G.S., and a number of programs leading to the Ph.D. degree. Graduate programs have been developed systematically to achieve academic excellence by careful utilization of institutional resources and regional opportunities. A highly qualified graduate faculty supervises programs and establishes the requirements for admission and degrees, which are administered by the dean of the Graduate School.

Most graduate programs are relatively small and permit students to work closely with faculty members in the area of specialization. The aim of graduate programs is to offer high-level professional training in their respective disciplines and to provide opportunities for students to learn and practice sound research methods. Graduate students are expected to use fully the available opportunities and to demonstrate the maturity and self-discipline necessary for sound scholarship.

Admission Graduate School admission may be granted to graduates of colleges and universities of approved standing, provided that applicants' undergraduate records are satisfactory.

Applications for admission and the Graduate Catalog containing detailed descriptions of graduate programs may be obtained from the Graduate School, Horton Social Science Center, UNH, Durham, New Hampshire 03824.

Early Admission—University of New Hampshire Seniors Qualified senior students at the University of New Hampshire may be admitted to the Graduate School provided they have followed normal application procedures; they must have been admitted for the semester in which they wish to enroll in courses for graduate credit. A 3.20 cumulative grade-point average is normally required to be considered for early admission. Such seniors are normally admitted prior to the start of their last undergraduate semester. Seniors who have been admitted under early admission may register for a maximum of two courses for graduate credit.

Dual Credit—UNH Seniors University of New Hampshire seniors who have been admitted to the Graduate School under early admission may, upon recommendation of the department and approval of the Graduate School, be allowed, for a maximum of two 800-level courses, to count credits toward both a bachelor's and master's degree. Dual credit forms must be completed and approved by the dean of the Graduate School at the beginning of the semester for which dual credit is sought. Dual credit forms are available at the Graduate School.

All 800-level courses are offered for graduate credit only and therefore only open to admitted or special graduate students.

Financial Assistance Graduate assistantships are available in most departments. These involve part-time work in connection with the University's instructional or research activities. University awards, such as tuition scholarships, are also available to qualified students. Assistantships and scholarships are awarded on the basis of academic qualifications.

Financial assistance in the form of College Work-Study and loans may be available through the Financial Aid Office.

Description of Courses

Explanation of Arrangement

The title and arabic number designate the particular course. When two course numbers precede a course title and are connected by a hyphen, the first semester of the course, or its equivalent, is a prerequisite to the second semester. If the course numbers are separated by a comma, qualified students may take the second semester without having had the first.

In courses that are not designated by title as laboratory courses, the notation "Lab" indicates that laboratory sessions are a part of the course.

Prerequisites and Corequisites

Each prerequisite for a course is separated from the other prerequisites by a semicolon; e.g., Prereq: Educ 601; Psyc 635. If permission (of the instructor, department, adviser, or committee) is a prerequisite for all students, it is listed among the prerequisites; e.g., Prereq: Educ 601; Psyc 635; permission. If, on the other hand, permission may be substituted for one or more of the listed prerequisites, it follows the other prerequisites and is separated from them by a slash mark; e.g., Prereq: Educ 601; Psyc 635;/or permission. If permission may be substituted for only one of the prerequisite courses, it is listed with the course for which it may be substituted; e.g., Prereq: Educ 601 or permission; Psyc 635.

Corequisites are courses that must be taken in the same semester.

Credits

The number of credits listed is the number of semester credits each course number will count toward graduation (except in the case of variable credit courses). Students must register for the number of credits shown or, if the course is variable credit, must register within the range of credits shown.

Cr/F following the description indicates that no letter grade is given but that the course is graded Credit or Fail.

For up-to-date information about when a course is offered; who teaches the course; the number of recitations, lectures, labs, and such, students are referred to each semester's *Time and Room Schedule,* which carries a complete schedule of course offerings for the semester.

The system of numeric designation is as follows:

200–299	Courses in Thompson School of Applied Science.* Full credit only to TSAS degree candidates, who may transfer partial credit toward other asssociate and baccalaureate degrees.
400–499	Introductory courses not carrying prerequisites and courses generally falling within University and college requirements.
500–599	Intermediate-level courses for undergraduate credit only.
600–699	Advanced-level undergraduate courses. Entrance to courses numbered 600 and above normally requires junior standing.
700–799	Advanced-level undergraduate courses. Ordinarily not open to freshmen and sophomores.
800–899	Courses that carry graduate credit only and therefore are open only to admitted or special graduate students.

*Course descriptions found in TSAS bulletin. UNH baccalaureate or associate in arts degree candidates may take 200-level courses for audit only, as the courses carry no graduation credits.

Administration (Admn)

(For program description, see page 79.)

PROGRAM DIRECTOR: James O. Horrigan
PROFESSORS: Robert F. Barlow, Stephen L. Fink, Russell I. Haley, James O. Horrigan, Manley R. Irwin, Fred R. Kaen, Marvin J. Karson, Dwight R. Ladd, Barry Shore, Linda G. Sprague, William E. Wetzel, Jr., Robin D. Willits, Dwayne E. Wrightsman
VISITING PROFESSOR: Eugene F. Grape
ADJUNCT PROFESSOR: R. Stephen Jenks
ASSOCIATE PROFESSORS: John H. Barnett, Robert L. Chew, John Freear, Francine S. Hall, Michael J. Merenda, Richard L. Mills, Melvin Sandler, Starr F. Schlobohm, Allen R. Thompson, Rita Weathersby
ADJUNCT ASSOCIATE PROFESSOR: Dale G. Broderick
ASSISTANT PROFESSORS: Eugene Bocialetti, Ahmad Etebari, James L. Grant, Allen M. Kaufman, Duncan G. LaBay, John H. Overton, Jeffrey E. Sohl, T. J. Wharton
VISITING ASSISTANT PROFESSOR: Richard D. Lamb
FACULTY IN RESIDENCE, ASSISTANT PROFESSOR: Timothy W. Edlund
INSTRUCTORS: Nancy L. Hansen, Robert B. Mitchell
LECTURERS: Ruth T. Broderick, Linnea M. Hirst, Naida Kaen, Elizabeth Lewis, Joseph E. Michael, Jr., Peter W. Royce
FACULTY IN RESIDENCE: Charles P. de Mortanges

424. BUSINESS STATISTICS
Introductory coverage of statistical methods for managerial decision making: probability, descriptive and inferential statistics, and regression. Quantitative techniques common to many introductory statistics courses are covered, but the emphasis is on understanding concepts such as uncertainty, inferences from sample data, and model formulation, and on utilizing these techniques as aids in decision making. No credit for students who have had Econ 525. 4 cr.

447. PERSONAL TAXATION
Summary of federal income taxation from the viewpoint of the individual. No credit toward an Admn major. 4 cr.

502. FINANCIAL ACCOUNTING
Concepts, procedures, and tools of analysis in selection, quantification, and communication of economic events affecting financial condition, income, and cash flows of organizations. (Not open to students who have had Admn 517 or DCE 462-463.) 4 cr.

503. MANAGERIAL ACCOUNTING
Planning, budgeting, and control. Emphasis on cost analysis in decision making. Prereq: Admn 502. 4 cr.

517. SURVEY OF BASIC ACCOUNTING
Concepts, conventions, and processes in financial and cost accounting. Usefulness and limitations of accounting data in decision making and in analyses of past results. (For non-Admn majors and minors. No credit for students who have had Admn 502 or DCE 462-463.) 4 cr.

523. ADVANCED BUSINESS STATISTICS
Multiple regression, time series analysis, experimental design, survey design, and analysis. Prereq: Admn 424. 4 cr.

524. QUANTITATIVE MODELS FOR MANAGEMENT
Introduction to management science models used most in business: decision theory, linear programming and distribution models, forecasting and time series analysis, Markov chains. Emphasis on application and utility of these models rather than on underlying mathematical theory. Problem formulation, data requirements, model assumptions, interpretation of results, sensitivity analysis. A decision-making and problem-solving theme runs throughout the course. Prereq: Admn 424. 4 cr.

526. INTRODUCTION TO BUSINESS DATA PROCESSING
Fundamentals of data processing with applications to the functional areas of management. Topics include system design, software, hardware, and applications. Prereq: Admn 424. 4 cr.

530. PERSONAL FINANCE AND INVESTMENT
Principles and practices of personal finance and investment. Investments in real estate, stocks and bonds, money-market instruments, savings accounts, and insurance and retirement plans. Personal saving, mortgages, consumer credit, and other means of financing investments. No credit toward a major in administration. 4 cr.

550. SURVEY OF MARKETING
Same material as Admn 651, but more general viewpoint. How companies plan products, pricing, advertising, promotion, distribution. Marketing of services. Consumer behavior. Consumerism. For non-Admn majors and minors. No credit for students who have had Admn 651. 4 cr.

580. INTRODUCTION TO ORGANIZATIONAL BEHAVIOR
Application of behavioral science concepts to work settings in profit and nonprofit organizations. Individual behavior, interpersonal relations, work groups, relations among groups—studied in the context of organizational goals and structure. Experiential focus. For non-Admn majors and minors. No credit for students who have had Admn 611. 4 cr.

602. VALUES IN A MANAGERIAL SOCIETY
The role and influence of values on management decision making. The conflict between traditional values such as material progress, private property, self-interest, etc., and emerging notions about environmentalism, consumerism, worker and product safety, etc. is examined through case discussions and readings. Prereq: Admn major or permission. 4 cr.

605. OPERATIONS RESEARCH
Synthesis and analysis of basic principles and methods of operations research applied to managerial decisions. Mathematical programming, networks, inventory, queuing, sequencing, scheduling, and Markovian models. Prereq: permission. 4 cr.

606. ADVANCED OPERATIONS RESEARCH
Analysis and synthesis of complex operations research models. Project is undertaken by all students. Advanced mathematical programming (nonlinear, parametric linear, stochastic, and dynamic), stochastic inventory models, advanced queuing models, and heuristic programs. Prereq: Admn 605 or permission. 4 cr.

611. BEHAVIOR IN ORGANIZATIONS
Application of behavioral science concepts to work settings and management. Focus on analyzing work situations and developing action recommendations based on understanding behavior. Major topics include individual behavior, interpersonal relations and communication, work groups, relations among groups—studied in the context of organizational goals and structure. Prereq: Group A courses or permission. 4 cr.

614. ORGANIZATIONAL ANALYSIS
Provides a framework and concepts for understanding the nature and functioning of organizations of various types: business, educational, health, social service. Enhances students' skills as organizational members and managers. Case discussions, class exercises, field work. Prereq: juniors and seniors only; prior study of organizational behavior or an equivalent is desirable. 4 cr.

626. ADVANCED COMPUTER SYSTEMS ANALYSIS AND DESIGN
Analysis and design of computer systems in administration. Applications in finance, accounting, marketing, and manufacturing. Case studies and projects. Prereq: Admn 526. 4 cr.

647, 648. BUSINESS LAW I, II
Law of contracts, agency, sales, negotiable instruments, real and personal property, partnership and corporations, with application of the Uniform Commercial Code. Prereq: at least junior status; permission. 4 cr.

650. OPERATIONS MANAGEMENT
Analysis of operational problems in the product and service sectors; standards, capacity, inventory, scheduling, and control. Prereq: all Group A courses; /or permission. 4 cr.

651. MARKETING
Marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Optimal blending of ingredients in the "marketing mix": product pricing, promotion, preliminary consumer behavior, marketing research, and selection of distribution channels. Prereq: all Group A courses; /or permission. 4 cr.

653. FINANCIAL MANAGEMENT
The firm's uses and sources of funds; working-capital management; capital budgeting; and administration of debt and equity. Prereq: all Group A courses; /or permission. 4 cr.

661. MANAGERIAL THINKING
Thinking processes that underlie management and administration; survey of human thought, history of management thought, and prevailing contemporary models of the management process. Suitable background for all upper-division administration courses. 4 cr.

695-696. INDEPENDENT STUDY
Individual research projects that are student designed. Initial sponsorship of a business administration faculty member must be obtained, and approval of WSBE adviser and dean. For juniors and seniors in high standing. 1-12 cr.

698. TOPICS IN ADMINISTRATION
Special topics; may be repeated. Prereq: permission. 4 cr.

701. BUSINESS AND ITS ENVIRONMENT
Managerial problem solving relative to the ethical, economic, social, political, and technical aspects of an organization's environment. Prereq: all courses in Group A and Group B. 4 cr.

703. BUSINESS POLICY
Capstone course, interrelating and applying specialized courses; cases of companies, firms, supplemented by economic and other information from published industry, company, and other sources. Prereq: all courses in Group A and Group B. 4 cr.

712. MANAGING ORGANIZATIONAL CHANGE
Presents conceptual and technical tools to manage the challenge of change, both unpredictable and predictable. Topics include the process of change; change strategies; change agent roles—internal and external; bases of resistance to change; coping with resistance. Prereq: juniors and seniors only; prior study of organizational behavior or an equivalent is desirable. 4 cr.

713. INTERPERSONAL SKILLS FOR MANAGERS
Focuses on student awareness of interpersonal style and its effectiveness in gaining personal and organizational rewards. Also considered is the process by which groups develop and the management of that development. Prereq: juniors and seniors only; lab fee may be charged. 4 cr.

714. MANAGING ORGANIZATIONAL CONFLICT
Conflict among individuals, small groups, and organizations. Analysis of cases, readings, simulations, and roleplays (often using video tape) develops useful concepts and skills for dealing with conflict. Students examine their own behavior in coping with conflicts within the class. Field project required. Prereq: juniors and seniors only; prior study of organizational behavior or an equivalent is desirable. 4 cr.

715. TRAINING THEORY AND PRACTICE
Design and implementation of management training programs and experiential education. Leadership of training groups and self-development processes. Prereq: Admn 713 or equivalent experience is desirable. 4 cr.

717, 739. ADVANCED FINANCIAL ACCOUNTING I, II
Theory and practice in regard to income measurement and asset valuation. Special topics including consolidations, partnerships, leases, pensions, price-level reporting, foreign currencies, and fund accounting. Prereq: All Group A courses and Admn 653. 4 cr.

718. COST AND MANAGEMENT
Effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital budgeting analysis. Prereq: Admn 503. 4 cr.

720. AUDITING
The attest function and the responsibility and professional ethics of the independent auditor in our society. Audit concepts, procedures, objectives, and reports. Operational audits, social audits, and management services. Prereq: Admn 717 or permission. 4 cr.

722. TOPICS IN ACCOUNTING
Special topics. Prereq: Admn 717 or 718, depending on topics; permission. 4 cr.

723. TOPICS IN FINANCE
Prereq: Admn 653. 4 cr.

724, 725. ADVANCED PRODUCTION PLANNING AND CONTROL I, II
Analysis and development of production planning and control systems. Topics include: inventory management, material requirements planning, capacity management, and production activity control. Prereq: permission. 4 cr.

726. DECISION-SUPPORT SYSTEMS
Exploration of computer usage in support of the problem-solving and decision-making process. Topics include conceptual foundations of decision-support systems, design of decision-support systems, spreadsheets, data base, and expert systems. Use of main frame and microcomputers, cases, projects; guest speakers. Prereq: all Group B courses; Admn 526; and permission. 4 cr.

728. STATISTICAL DECISION MAKING
Probability and statistics applied to decision problems. Bayesian approach to decisions under uncertainty, which explicitly injects prior judgments of decision makers and the consequences of alternative actions. Prereq: Admn 424 or equivalent. 4 cr.

730. INVESTMENTS ANALYSIS
Security valuation, efficient markets, portfolio management, options, and alternative investments. Computer research topics. Prereq: Admn 653. 4 cr.

732. EXPLORATION IN ENTREPRENEURIAL MANAGEMENT
Examination of the management of change and innovation with particular attention to the role of the entrepreneur in the management of new ventures. Characteristic behavioral, organizational, financial, and marketing problems of entrepreneurs and new enterprises. Prereq: permission. 4 cr.

742. MANAGEMENT INFORMATION SYSTEMS
Concepts, design, and implementation of systems to provide information and support for managerial decision making. Use of computers, models, and behavioral factors from the manager's perspective. Prereq: juniors and seniors only. 4 cr.

745. INTERNATIONAL BUSINESS
Issues and problems confronting managers in the international economy. Emphasis on problems of working across national borders rather than on those encountered within the framework of different national economies, cultures, and institutions. For managers working in a multinational enterprise. Prereq: permission. 4 cr.

746. INTERNATIONAL FINANCIAL MANAGEMENT
Financial management problems facing multinational firms. Primary focus on effects of currency denominations on financial decisions. Prereq: Admn 653. 4 cr.

747. BUSINESS TAXATION
Taxation factors relevant to business decisions. Emphasis upon federal income taxation from the viewpoint of the firm. Prereq: Admn 502. 4 cr.

750. MARKETING MANAGEMENT
Practical application of theories taught in Admn 651. Planning, organization, and control of marketing activities in large corporations and small businesses; new-product development; pricing policies; selection of channels of distribution; interrelationships between marketing, production, and finance. Sound policy formulation and decision making established through analysis of cases and computer simulation. Prereq: a basic marketing course. 4 cr.

751. ADVERTISING AND PROMOTION
Advertising, personal selling, and other promotional tools to help solve marketing problems; advertising as a medium of communication and as a social-cultural force in the Western world. Prereq: Admn 651 or permission. 4 cr.

752. MARKETING RESEARCH
Identification, collection, and analysis of data for the marketing process. Strengths, limitation, environment, and evaluation of research in the marketing process. Prereq: Admn 651 or equivalent. 4 cr.

755. ADVANCED BUSINESS FINANCE
Development of analytical tools and practical skills for recognizing and solving complex problems of business finance. Working-capital management, capital budgeting, cost of capital, capital structure, and dividend policy. Prereq: Admn 653. 4 cr.

756. MANAGEMENT OF FINANCIAL INSTITUTIONS
How financial institutions manage their sources and uses of funds; impact of external environmental factors upon the operation and performance of financial institutions. Optimal portfolio strategies for commercial banks, savings and loan associations, mutual savings banks, insurance companies, and pension funds. Implications of monetary theory for individual financial institution policies; credit analysis; competition among financial institutions; regulation of financial institutions. Prereq: Admn 653. 4 cr.

761. SALES MANAGEMENT
Principles and methods of successful salesmanship and management of the sales function. Selling experiences in fields of student interest; case studies, sales presentations; oral and written analyses of sales management issues. Prereq: Admn 651. 4 cr.

762. MARKETING WORKSHOP
Integrative study of a real marketing situation in a business, nonprofit institution, or government

agency. Student teams identify problem, research or collect data, suggest alternate solutions, and submit a recommended course of action. Prereq: Admn 651 or Admn 808; one additional advanced marketing course; permission. 4 cr.

770. PERSONNEL ADMINISTRATION
Role of personnel administration and human resource management in achieving goals in "for-profit" and "not-for-profit" organizations. Functions of management; scope, technique, and current issues of personnel administration; organization of personnel activities and staff. How managers relate to personnel administration and interact with personnel administration staff and services. Prereq: permission. 4 cr.

775. LABOR-MANAGEMENT RELATIONS
Study of the legal, economic, and institutional environment within which labor-management relations occur and of the processes and goals that determine the rules governing labor-management relations. Focus on relations in the U.S., covering union and non-union and private and public enterprises. Issues considered include employee discipline, seniority and performance appraisal, and job rights versus management rights. Grievance administration, arbitration, and contract negotiations also examined. Prereq: senior standing or permission. 4 cr.

780. ISSUES FOR MEN AND WOMEN AS MANAGERS
With changing work patterns and family roles, male and female managers need new skills and sensitivities to work together effectively. Course seeks to heighten awareness of gender-related attitudes and behaviors as they affect work interactions. Topics include implications of gender expectations for leadership, communication, and career success; impact of stereotypical attitudes and behaviors; issue of sexual attraction and harassment at work; and considerations for balancing career and family. Prereq: senior standing; permission. 4 cr.

785. CAREER MANAGEMENT
Develops individual career management skills. Topics include concepts of career development; issues pertaining to career management in organizations. Helpful for students interested in human resource management. Prereq: juniors and seniors only; permission. 4 cr.

795. INTERNSHIP
On-the-job skill development through fieldwork in an organization (business, industry, health, public service, etc.). Normally, supervision is provided by a qualified individual in the organization, with frequent consultation by a faculty sponsor. Written report required. Internships may be part- or full-time, with course credits assigned accordingly. 1–16 cr.

798. TOPICS IN ADMINISTRATION
Special topics; may be repeated. Prereq: consent of adviser and instructor. 1–4 cr.

Aerospace Studies (Aero), Reserve Officer Training Corps

(For program description, see page 85.)

PROFESSOR OF AEROSPACE STUDIES: Col. Noel F. Austin
ASSISTANT PROFESSORS: Capt. Gloria A. L. Copeland, Capt. Vincent J. Palo

Leadership Laboratory is required each semester of all Air Force ROTC students seeking commissions as second lieutenants in the U.S. Air Force upon graduation. Students taking Air Force ROTC courses for credit, but not seeking commissions, need not register for this lab.

301. LEADERSHIP LABORATORY
Taken by all AFROTC cadets throughout enrollment in AFROTC. Command and staff leadership experiences in cadet corps. Air Force customs and courtesies, drill and ceremonies, career opportunities, and life and work of junior officer. Student leadership potential developed in a practical, supervised laboratory. Field trips to Air Force installations. 0 cr.

415. THE AIR FORCE TODAY I
Development, mission, and organization of the Air Force as an instrument of the U.S. national defense policy. 1 cr.

416. THE AIR FORCE TODAY II
Major Air Force commands; roles of separate operating agencies; organization, systems, and operations of strategic defense; general-purpose aerospace support forces. 1 cr.

541. THE DEVELOPMENT OF AIR POWER I
The nature of warfare; development of air power from balloons and dirigibles through World War II. 1 cr.

542. THE DEVELOPMENT OF AIR POWER II
Development of air power from post-World War II through the peaceful use of air power in Berlin; the Cuban crisis; air war in Southeast Asia; and research and development of present and future aerospace vehicles. 1 cr.

671. AIR FORCE MANAGEMENT AND LEADERSHIP I
An integrated management course emphasizing the individual as a manager in the Air Force. Motivation and behavior, leadership, communication, group dynamics, and decision making in a changing environment. Air Force cases studied. 4 cr.

672. AIR FORCE MANAGEMENT AND LEADERSHIP II
Organizational and personal values; management of forces in change; organizational power, politics, managerial strategy, and tactics; Air Force cases studied. 4 cr.

681-682. NATIONAL SECURITY FORCES IN CONTEMPORARY AMERICAN SOCIETY I AND II
A full-year course focused on the armed forces as part of American society, emphasizing civil-military

relations in context of U.S. policy formulation and implementation. Attitudes toward the military; socialization processes; role of the professional military leader-manager; requirements for adequate national security forces; political, economic, and social constraints on the national defense structure; impact of technological and international developments on strategic preparedness; the variables involved in the formulation and implementation of national security policy; military justice and administrative law. 4 cr each semester.

Animal and Nutritional Sciences (ANSc)

(For program description, see page 42.)

CHAIRPERSON: William A. Condon
PROFESSORS: Thomas P. Fairchild, James B. Holter, Samuel C. Smith, Richard G. Strout, Henry J. Thompson, Willard E. Urban, Jr.
ASSOCIATE PROFESSORS: William E. Berndtson, William A. Condon, Walter E. Hylton, Charles G. Schwab, Anthony R. Tagliaferro
ASSISTANT PROFESSORS: Janet C. Briggs, Roger A. Cady, Joanne Curran-Celentano, Richard W. Fite, Thomas L. Foxall, Colette H. Janson, Alan H. Parsons, Robert L. Taylor, Jr., Roger E. Wells
LECTURERS: Patricia D. Bedker, Kathleen Curwen, Joseph J. Moore, Elizabeth C. Smith
TEACHER/TRAINER: Amy S. Dickens
EXTENSION EDUCATORS: Nancy R. Deuel, F. Carlton Ernst, Jr.

400. FOOD AND PEOPLE
Nutrition and food science; biological, social, political, economic, and historical significance of food. Animal food products. (Also offered as Nutr 400.) 4 cr.

401. INTRODUCTION TO THE ANIMAL SCIENCES
Overview of dairy, livestock, light horse, and poultry industries; animal physiology, nutrition, genetics, and diseases; animal products and human health; animal science research. Lab. 4 cr.

402. HORSEMANSHIP
For beginning, intermediate, and advanced riders. Basics of balance seat, specializing in basic dressage and combined training. Limited number of students may stable their horses at the University. A fee is charged. May be repeated for a maximum of 12 credits. 2 cr.

404. INTRODUCTORY EQUINE SCIENCE
An introduction to the horse industry encompassing nutrition, genetics, breeds, selection procedures, and health maintenance. Lab. 4 cr.

405. FOOD AND SOCIETY
Consideration of the cultural significance of food, emphasizing historical, psychological, social, political, and economic aspects. (Also offered as Nutr 405.) 4 cr.

406. CAREERS IN ANIMAL SCIENCE
A survey of various areas of animal and veterinary science and opportunities available. Required of all ANSc and pre-vet freshmen; open to others by permission. 1 cr. Cr/F.

501. ANIMAL ANATOMY AND PHYSIOLOGY
General anatomy and physiology of domestic animals and birds. 4 cr.

502. FUNDAMENTALS OF ANIMAL HEALTH
Principles of disease mechanisms: causes, body reactions, and immunology. Prerequisite for other ANSc disease courses. 2 cr.

503. ABATTOIR MANAGEMENT
Licensing requirements, sanitation, inspection facilities, and use of the slaughterhouse; field trips. Prereq: permission. Lab. 2 cr.

504. MEAT AND ITS PRODUCTS
Slaughtering, cutting, and identification of beef, lamb, pork, and poultry; field trips. Lab. 3 cr.

507. THE SCIENTIFIC APPROACH TO EQUINE DISCIPLINE
Physiological development, control, and education; bitting, longeing, driving, and equine gymnastics. Prereq: ANSc 402; permission. Lab. 2 cr.

508. DAIRY HUSBANDRY CLINIC
Practical experience in dairy husbandry techniques. Only for students with no previous experience in dairy husbandry. Prereq: permission. 2 cr. Cr/F.

550. LIVESTOCK MANAGEMENT
Economic principles and management factors involved in the production of beef, sheep, and swine. Lab. 4 cr.

552. INTRODUCTORY DAIRY HERD MANAGEMENT
Economic principles and management factors involved in successful dairy herd management. Criteria for success, record keeping, applied genetics, housing, materials handling, feeding, and health care are topics covered. 3 cr. (Not offered every year).

554. INTRODUCTORY DAIRY HERD MANAGEMENT LAB
Practical study of various aspects of dairy herd management. Farm visits and case studies will be involved. Should be taken concurrently with ANSc 552. 1 cr. (Not offered every year).

556. POULTRY MANAGEMENT
Economic principles and management factors involved in poultry production. Lab. 4 cr. (Not offered every year).

601. LIVESTOCK SELECTION
Principles of selecting beef, sheep, and swine based on performance, pedigree analysis, progeny testing, and type evaluation. Lab. 2 cr.

603. DAIRY CATTLE SELECTION
Principles of selecting dairy cattle based on performance, pedigree analysis, progeny testing, and type evaluation. Lab. 2 cr.

604. LIGHT HORSE SELECTION
Principles of selecting light horses based on performance, pedigree, progeny records, and type evaluation. Lab. 2 cr.

605. PRINCIPLES OF NUTRITION
Principles underlying nutrition of animals; digestion, absorption, and intermediary metabolism; function of nutrients in maintenance, growth, and production; metabolic disorders resulting from inappropriate intake of nutrients. Prereq: 1 year of chemistry; 1 semester of physiology. (Also offered as Nutr 605.) Lab. 4 cr.

607. SMALL ANIMAL DISEASES
Common diseases in companion animals; emphasis on canine and feline medicine. Prereq: ANSc 502. 2 cr.

610. FEEDS AND FEEDING
Classification, identification, and characteristics of animal feedstuffs; feed processing and palatability; feeding methods; balancing rations; specific application to dairy, beef, sheep, goats, swine, poultry, horses, rabbits, mink, and fish. Prereq: ANSc 605. Lab. 4 cr.

612. GENETICS OF DOMESTIC ANIMALS
Application of Mendelian principles to traits of domestic animals with particular emphasis on economically important traits of farm animals. Principles of population and quantitative genetics will be introduced. Topics will include sex linkage, Hardy-Weinberg Law, meiosis, elementary statistics, genetic relationships, and heritability. Lab. 4 cr.

614. DISEASES AND PARASITES OF WILDLIFE
An ecological approach to some of the more common diseases and parasites of fishes, birds, game, and fur-bearing mammals. Influence of environment and management practices on the incidence and severity of diseases; relationship of wildlife diseases to human health. Prereq: permission. 3 cr.

616. WILDLIFE DISEASE LABORATORY
Demonstrates necropsy techniques and examination of wildlife specimens for common parasitic and other diseases. Restricted to wildlife management majors only. Prereq: ANSc 614, or may be taken concurrently. 1 cr. Cr/F.

617. LIVESTOCK DISEASES
Common veterinary problems of dairy and beef cattle, sheep, goats, and swine. Prereq: ANSc 502 or equivalent. 2 cr.

619. LIVESTOCK DISEASE CLINIC
Disease principles applied to clinical cases in the University herds and flocks; practical treatments and methods. Should be taken concurrently with ANSc 617. Prereq: ANSc 502 and permission. 2 cr.

620. EQUINE DISEASES AND PARASITES
Common veterinary problems of horses, including infectious diseases, colic, parasites, and lameness. Prereq: ANSc 502 or equivalent. 2 cr.

622. EQUINE DISEASE CLINIC
Disease principles applied to clinical cases in the University herd. Should be taken concurrently with ANSc 620. Prereq: ANSc 502 and permission. 2 cr.

652. ADVANCED EQUINE MANAGEMENT
Application of nutrition, reproduction, exercise physiology, environmental requirements, and economics to the management of race, show, training, and breeding operations. Prereq: ANSc 404; one semester of applied nutrition; one semester of general physiology;/or permission. Lab. 4 cr.

653-654. PRINCIPLES OF TEACHING EQUITATION
Teaching techniques and procedures, with emphasis on dressage; opportunity to teach riding theory and techniques to other students under supervision of instructor. Teaching certificate awarded to students successfully completing course. Prereq: ANSc 402, 507, and 652; permission. A fee is charged. Lab. A year-long course; 4 cr. each semester, 8 cr. total, an "IA" grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.

695-696. SUPERVISED TEACHING EXPERIENCE
Participants are expected to perform such functions as leading discussion sections, directing and assisting in laboratories, and assisting students with their problems in courses that participants have completed successfully. Enrollment is limited to juniors and seniors who have a minimum 3.00 cumulative average. Prereq: permission of instructor and department chairperson. 1-2 credits. May be repeated up to a maximum of 4 credits. Cr/F.

697. ANIMAL SCIENCE SEMINAR
Survey: recent literature and research. 2 cr.

700. CRITICAL ISSUES IN NUTRITION
Critical review and analysis of controversial topics in nutrition; emphasis on developing analytical reasoning skills. Prereq: permission of instructor. (Also offered as Nutr 700.) 4 cr. (Fall semester only.)

701. PHYSIOLOGY OF REPRODUCTION
Comparative aspects of embryology, anatomy, endocrinology, and physiology of reproduction. Lab. 4 cr.

702. EXPERIMENTAL ENDOCRINOLOGY OF REPRODUCTION
Discussions of current research literature plus application of laboratory techniques to the study of hormone relationships in the reproductive system. Prereq: ANSc 701 and permission. Lab fee. Lab. 4 cr.

704. PRINCIPLES OF PATHOBIOLOGY
Principles of disease processes; reactivity of the diseased cell, tissue, and organ. Prereq: ANSc 501, 502, and a 600-level disease course; /or permission. 3 cr.

709. BIOCHEMISTRY OF NUTRITION
Intermediary metabolism of nutrients and energy; metabolism transport mechanisms; biological oxidations; interrelationships of carbohydrate, fat, and protein metabolism; obesity; control of hunger and appetite. Prereq: college course in biochemistry. (Also offered as Nutr 709.) Lab. 4 cr.

710. RUMINANT NUTRITION
Feeding and related management of ruminant animals with special emphasis on dairy cattle; nutrients and their use, digestive anatomy and physiology, energy systems, forage systems, metabolic disorders, economical ration balancing. Prereq: ANSc 605. 4 cr.

712. ANIMAL BREEDING AND IMPROVEMENT
Principles of genetic evaluation; selection and breeding systems as they apply to the genetic improvement of farm animals. Prereq: ANSc 612 or permission. Lab. 4 cr. (Not offered every year.)

714. INTRODUCTION TO ELECTRON MICROSCOPY
Principles, theory, and methods used in preparing and examining vertebrate tissues in transmission and scanning electron microscopes. Interpretation of electron micrographs. Prereq: general chemistry; permission. 3 cr.

715. INTRODUCTION TO ELECTRON MICROSCOPY LAB
Application of principles and theories presented in ANSc 714. Fixation embedding ultramicrotomy, critical point drying operation of transmission and scanning electron microscopes and photographic procedures. Prereq: permission. Coreq: ANSc 714. 2 cr.

716. AVIAN DISEASES
Diagnosis, treatment, and control of major bacterial, viral, and fungal diseases; parasite infestations; and nutritional deficiencies of birds. Diseases of commercial poultry are emphasized, but those occurring in pet and wild birds are also included. Labs will cover avian pathology and immunology. Permission. 4 cr.

717. MAMMALIAN PHYSIOLOGY
A systems-level course with emphasis on basic physiologic concepts and the functional principles of the nervous, muscular, skeletal, and cardiovascular systems. Prereq: one year of introductory animal anatomy and physiology and one semester of biochemistry or permission. 4 cr.

718. MAMMALIAN PHYSIOLOGY
A systems-level course with emphasis on the respiratory, gastrointestinal, excretory, reproductive, and endocrine systems. Prereq: one year of introductory animal anatomy and physiology and one semester of biochemistry or permission. 4 cr.

720. MANAGERIAL PROCESSES IN NUTRITION PROGRAMS
Focus on managerial processes of planning, leading, and evaluating nutrition programs and the skills and tools needed to develop and present such programs. (Also offered as Nutr 720.) 4 cr. (Not offered every year.)

722. IMMUNOBIOLOGY
Study of the molecules, cells, and tissues of the immune system. Experimental foundations of immune ontogeny and phylogeny, cellular interactions, regulatory mechanisms, and immunogenetics. Analysis of the immune response using cellular and humoral techniques. Prereq: Micr 705 or permission. Lab. 4 cr.

750. HUMAN NUTRITION
Detailed analysis of the nutrient requirements throughout the life cycle. Nutrient needs are evaluated in the context of their physiological and biochemical functions. Prereq: basic nutrition. Coreq: ANSc 751. (Also offered as Nutr 750.) 4 cr. (Fall semester only.)

751, 752. PRACTICAL APPLICATIONS IN NORMAL AND THERAPEUTIC NUTRITION
Supervised practical experience in dietetics in clinical and community settings including several cooperating New Hampshire hospitals. Emphasis on patient interviewing, evaluation, counseling, and instruction; experimental techniques in anthropometric and biochemical assessment of nutritional status stressing principles of normal nutrition and changes induced by disease. Coreq for 751: ANSc 750. Coreq for 752: ANSc 774. (Also offered as Nutr 751, 752.) Lab. 3 cr.

774. CLINICAL NUTRITION
Application of principles of normal nutrition and physiology to clinical problems; altered nutrient requirements in human disease. Prereq: basic nutrition and biochemistry or permission. Coreq: ANSc 775. (Also offered as Nutr 774.) 4 cr. (Spring semester only.)

796. INVESTIGATIONS IN THE ANIMAL SCIENCES
Problems in: A) Genetics; B) Nutrition; C) Management; D) Diseases; E) Products; F) Light Horsemanship; G) Physiology; H) Cell Biology. Prereq: permission. May be repeated. 1-4 cr.

798. CONTEMPORARY TOPICS IN BIOMEDICAL SCIENCE AND NUTRITION
Lecture-discussion series on topics in animal biology, nutrition, and medicine including: production and applications of monoclonal antibodies; oncogenesis; sports nutrition; nutrition and cancer; toxicology; atherogenesis. 2 cr. Cr/F.

Anthropology

(For program description, see page 26.)

(See Sociology and Anthropology.)

The Arts (Arts)

(For program description, see page 27.)

CHAIRPERSON: David S. Andrew
PROFESSORS: Sigmund M. Abeles, Melvin J. Zabarsky
ASSOCIATE PROFESSORS: David S. Andrew, Arthur E. Balderacchi, Margot Clark, F. Conley Harris, Maryse Searls McConnell, Michael McConnell, Richard D. Merritt, Winifred C. Shaw, David R. Smith, Daniel L. Valenza, Mara R. Witzling
ASSISTANT PROFESSORS: Carol Aronson, Craig A. Hood, Scott Schnepf
FACULTY IN RESIDENCE, ASSISTANT PROFESSOR: Marguerite Walsh
LECTURER: Robert T. Hooper

Art Studio
Two-Dimensional Courses

All courses elective by permission of the Department of the Arts.

The following courses are sequential drawing experiences, from the basic elements of line, form, space, etc., in various drawing media, concentrating on still-life and figure, and leading to conceptual exercises with emphasis on the individual's drawing development.

432. DRAWING I
Lab. 4 cr.

532. DRAWING II
Prereq: Arts 432. Lab. 4 cr.

533. DRAWING III
Prereq: Arts 532. Lab. 4 cr.

632. DRAWING IV
Prereq: Arts 533. Lab. 4 cr.

633. DRAWING V
Prereq: Arts 632. Lab. 4 cr.

455. INTRODUCTION TO ARCHITECTURE
Study of architectural graphics, design theories, form determinants, and the architect in society. Course includes case study projects. Lab. 4 cr.

The following courses are sequential painting experiences. Aspects of composition, color, and conceptualization.

546. OIL PAINTING I
Prereq: Arts 432. Lab. 4 cr.

547. OIL PAINTING II
Prereq: Arts 546. Lab. 4 cr.

646. OIL PAINTING III
Prereq: Arts 547. Lab. 4 cr.

647. OIL PAINTING IV
Prereq: Arts 646. Lab. 4 cr.

746. PAINTING V
Prereq: Arts 647. Lab. 4 cr.

747. PAINTING VI
Prereq: Arts 746. Lab. 4 cr.

544. WATER MEDIA I
Transparent and opaque water color. Prereq: Arts 546. Lab. 4 cr.

645. WATER MEDIA II
Continuation of Arts 544; introduction to other water-based media. Prereq: Arts 544 or 547. Lab. 4 cr.

551. PHOTOGRAPHY I
Theory and practice of black-and-white creative photography. Students should provide their own cameras. Lab. 4 cr.

552. PHOTOGRAPHY II
Theory and practice of creative color photography. Camera and laboratory manipulative methods in black and white and/or color. Students should provide their own cameras. Prereq: Arts 551. Lab. 4 cr.

651. PHOTOGRAPHY III
Application of new materials and methods. Students should provide their own cameras. Prereq: Arts 552. Lab. 4 cr.

536. INTRODUCTORY PRINTMAKING
Graphic arts in a range of media. Prereq: Arts 532. Lab. 4 cr.

636, 637. PRINTMAKING WORKSHOP
Prereq: Arts 536. Lab. 4 cr.

598. SOPHOMORE SEMINAR
Encourages experimentation by integrating verbal and plastic understandings through readings, discussions, studio work. Field trips. Prereq: 2 art history courses and 2 studio arts courses. 4 cr.

695. SPECIAL PROBLEMS IN THE VISUAL ARTS
(See description under Three-Dimensional Courses.)

796. INDEPENDENT STUDY IN THE VISUAL ARTS
A) Photography; B) Sculpture; C) Drawing; D) Painting; E) Graphics; F) Water Media; G) Architectural Design; H) Curatorial Assistant; I) Art History; J) Ceramics; K) Jewelry and Metalsmithing; L) Weaving; M) Wood Design. Open to highly qualified juniors and seniors. Prereq: permission of department chairperson and supervising faculty member or members. May be repeated to a total of 8 cr. 1–8 cr.

798. SEMINAR/SENIOR THESIS
Readings and discussions oriented toward the intellectual premises of art. Culminates in mounting an exhibition of the student's work. Required of all students in the B.F.A. program. Other advanced students may elect with instructor's permission. A year-long course; an "IA" grade (continuous course) will be given at the end of the first semester. Lab. Variable credit; may be repeated to a total of 8 credits. BFA majors must take 8 credits total. 1–8 cr.

Three-Dimensional Courses

All courses elective by permission of the Department of the Arts.

The following courses are sequential ceramics experiences. These courses cover all methods of basic construction, decoration, glazing and firing, with particular emphasis on each individual's perceptual development.

501. CERAMICS I
Lab. 4 cr.

502. CERAMICS II
Prereq: Arts 501. Lab. 4 cr.

601. CERAMICS III
Prereq: Arts 502. Lab. 4 cr.

701. CLAY AND GLAZE FORMULATION
Prereq: Arts 502; 601. Lab. 4 cr.

The following courses are sequential metalsmithing experiences. Methods and materials of jewelry making and metalsmithing.

513. JEWELRY AND METALSMITHING I
Lab. 4 cr.

514. JEWELRY AND METALSMITHING II
Prereq: Arts 513. Lab. 4 cr.

613. JEWELRY AND METALSMITHING III
Prereq: Arts 514. Lab. 4 cr.

The following courses are sequential weaving experiences using four- to eight-harness looms.

519. WEAVING I
Lab. 4 cr.

520. WEAVING II
Prereq: Arts 519. Lab. 4 cr.

619. WEAVING III
Prereq: Arts 520. Lab. 4 cr.

The following courses are sequential sculpture experiences. Principles, methods, and concepts of sculpture.

567. SCULPTURE I
Lab. 4 cr.

568. SCULPTURE II
Prereq: Arts 567. Lab. 4 cr.

667. SCULPTURE III
Prereq: Arts 568. Lab. 4 cr.

668. SCULPTURE IV
Prereq: Arts 667. Lab. 4 cr.

767. CASTING
Study with cast bronze and aluminum sculpture. Prereq: two 600-level studio courses in the 3-D discipline. Lab. 4 cr.

525, 526. WOODWORKING
Principles and materials of woodworking. Lab. 4 cr.

625, 626. WOOD/FURNITURE DESIGN
Studio design and construction of major furniture forms. Prereq: Arts 525. Lab. 4 cr.

725. WOOD MULTIPLES
Development and construction of prototype designs intended for more than one-of-a-kind production. 4 cr.

598. SOPHOMORE SEMINAR
(See description under Two-Dimensional Courses.)

695. SPECIAL PROBLEMS IN THE VISUAL ARTS
Topics and prerequisites to be announced before preregistration. May be repeated with permission of the instructor. Lab. 4 cr.

(See also Arts 796 and 798.)

Art History

Exemption from prerequisites by permission of instructor.

431. VISUAL STUDIES
Appreciation and understanding of the visual arts. Works from variety of periods; emphasis on style, formal analysis, methods, and materials of production. For freshmen and sophomores; open to juniors and seniors by permission. 4 cr.

485. ARCHITECTURAL HISTORY
A survey of the chief and representative buildings from the entire history of architecture. Analysis of buildings with regard to structure, form, and symbolic content, concentrating on major works such as the pyramids, the Roman Pantheon, the Gothic cathedral, the Renaissance palace, the Baroque church, and the modern skyscraper. 4 cr.

487. THEMES AND IMAGES IN ART
Examination of one or two central ideas embodied in the artistic imagery of painting, sculpture, and architecture, covering a wide cultural spectrum. Stress on the interconnection between visual forms and the symbolic and philosophical concepts they express. Papers and essay examinations are required. A) Classicism and its Discontents; B) Nature and Culture in Art; C) Archetypes and Images; D) Major Mythic Images of Women; E) Symbols of Innocence and Experience in the New World. Descriptions of sections available from the art department office. May not be repeated for credit. 4 cr.

570. ART OF THE ANCIENT WORLD
The chief and representative monuments in architecture, sculpture, and painting from Paleolithic times to the late Roman Empire. The history of art from a broadly humanistic perspective with investigation of works such as Stonehenge, the pyramids at Giza, Mesopotamian votive figures, the Parthenon and its sculptures, and illusionistic Roman frescoes at Pompeii. 4 cr.

571. ART OF THE MIDDLE AGES
The chief and representative monuments in architecture, sculpture, and painting from early Christian times to the Gothic era. The history of art from a broadly humanistic perspective with investigation of works such as the Constantinian basilicas, Byzantine mosaics, the *Lindisfarne Gospels,* the portal sculpture of Autun, and Chartres cathedral. 4 cr.

572. ART OF THE AGE OF HUMANISM
The chief and representative monuments in architecture, sculpture, and painting from the early Florentine Renaissance to the courtly era of Louis XVI. The history of art from a broadly humanistic perspective with investigation of works such as Masaccio's frescoes, Michelangelo's *David,* the Ghent Altarpiece, the basilica of St. Peter's, Rembrandt's self-portraits, and the Georgian house in Portsmouth. 4 cr.

573. ART OF THE MODERN WORLD
The chief and representative monuments in painting, sculpture, and architecture from the Age of Reason to the present. The history of art from a broadly humanistic perspective with investigation of works such as David's revolutionary paintings, Monet's *Water Lilies,* Picasso's *Guernica,* Pollock's drip paintings, Sullivan's skyscrapers, and Rodin's *Gates of Hell.* 4 cr.

597. ART OF THE FAR EAST
A basic survey of painting, sculpture, and architecture of India, China, and Japan, with emphasis on the relation of philosophical concepts to imagery. 4 cr. (Not offered every year.)

610. AMERICAN STUDIES: NEW ENGLAND CULTURE IN CHANGING TIMES
A team of three instructors from history, literature, and art investigate major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620-90; the Transcendental period, 1830-60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as Engl 610, Hist 610, and Huma 610.) Not for art studio major credit. 4 cr.

654. 17TH- AND 18TH-CENTURY AMERICAN ARCHITECTURE
Chief colonial architectural styles and monuments; their relation to European antecedents. Field trips. Prereq: two 400- or 500-level art history courses. 4 cr.

655. EARLY MODERN ARCHITECTURE: REVOLUTION TO WORLD WAR I
Chief styles and monuments of American and European architecture from the "visionaries" (Ledoux, Latrobe, Jefferson) to the birth of the skyscraper and "nonhistorical" architecture. Unique American contribution to modern architectural thought. Field trips. Prereq: two 400- or 500-level art history courses. 4 cr.

656. CONTEMPORARY ARCHITECTURE: THE BUILDINGS OF OUR TIMES
Chief styles and monuments of American and European architecture from Frank Lloyd Wright and the International Style to the present. Field trips. Prereq: two 400- or 500-level art history courses. 4 cr.

675. GREEK AND ROMAN ART
Art and architecture in ancient Greece and Rome from about 1500 B.C. through the fourth century A.D. Emphasis on classical Greek art of the fifth century B.C. and Roman Imperial art of the first and second centuries A.D. Prereq: two 400- or 500-level art history courses. 4 cr.

677. EARLY MEDIEVAL ART
The development of Christian art to include early Christian art, Byzantine art in the East and West, Coptic art, and Christian art in northern Europe to the 11th century. Architecture, painting, sculpture, and the minor arts. Prereq: two 400- or 500-level art history courses. 4 cr.

678. ROMANESQUE AND GOTHIC ART
Art in western Europe from the 11th to the 15th century: architecture, sculpture, painting, and the minor arts. Prereq: two 400- or 500-level art history courses. 4 cr.

679. NORTHERN RENAISSANCE ART
Painting, sculpture, and graphic arts in the Lowlands, Germany, Austria, and France from the 14th to the 16th century. The particularly Northern viewpoint will be considered through analysis of such major figures as van Eyck, van der Weyden, Bosch, Dürer, and Bruegel. Prereq: two 400- or 500-level art history courses. 4 cr.

681. ITALIAN RENAISSANCE ART I
Painting, sculpture, and architecture in Italy during the 14th and 15th centuries. The emergence of Renaissance style in the art of such masters as Giotto, Masaccio, Donatello, Bellini, and Piero della Francesca. Attention is also given to the broad cultural developments to which they belong. Prereq: two 400- or 500-level art history courses. 4 cr.

682. ITALIAN RENAISSANCE ART II
Continuation of Arts 582. Primary focus on the formation of High Renaissance classicism in the art of Leonardo, Michelangelo, Raphael, Bramante, and Titian. Attention is also given to the subsequent crisis of the classical ideal in 16th-century Mannerism. Prereq: two 400- or 500-level art history courses. 4 cr.

683. BAROQUE ART IN SOUTHERN EUROPE
Painting, sculpture, and architecture in Italy, France, and Spain during the 17th century. Emphasis on the diverse and innovative character of art in this period of crisis between the Renaissance and the modern era. Intensive analysis of the works of such major masters as Bernini, Caravaggio, Poussin, and Velazquez. Prereq: two 400- or 500-level art history courses. 4 cr.

684. BAROQUE ART IN NORTHERN EUROPE
Dutch and Flemish painting in the seventeenth century. Examination of such major figures as Rubens, Rembrandt, Van Dyck, and Vermeer. Attention is also given to the development of the genres and to the many "little masters" who practiced them. Prereq: two 400- or 500-level art history courses. 4 cr.

686. NINETEENTH-CENTURY EUROPEAN ART
European painting and sculpture in its socio-political context, with emphasis on the relation of idea to image, from David and the French Revolution to Cézanne, Seurat, and the Franco-Prussian War. Prereq: two 400- or 500-level art history courses. 4 cr.

688. TWENTIETH-CENTURY EUROPEAN ART
Evolution of Modernism from Symbolism and Post-Impressionism; contributions to art theory of Cubism, Expressionism, Non-Objectivity, and Surrealism. Prereq: two 400- or 500-level art history courses. 4 cr.

689. AVANT-GARDE ART IN AMERICA
Tentative history of the New York art scene, with emphasis on art theory and the new technical means becoming available. Prereq: two 400- or 500-level art history courses. 4 cr.

693. AMERICAN ART
A chronological survey of painting and sculpture in the United States from the colonial period to the present. Prereq: two 400- or 500-level art history courses. 4 cr.

695. SPECIAL PROBLEMS IN THE VISUAL ARTS
(See description under Three-Dimensional Courses.)

696. METHODS OF ART HISTORY
Essential bibliography and the methodology of research; the variety of approaches to art historical scholarship. Readings, discussion, and projects in connoisseurship, iconography, historiography, and museology. Open to advanced students with a strong art history background. Prereq (for non-art history majors): permission. 4 cr.

698. SEMINAR IN ART HISTORY
Topics and prerequisites to be announced before preregistration. May be repeated with permission of instructor. 4 cr.

699. MUSEUM STUDIES
Introduction to museum practices. History of museums: their purposes, organization, interpretation,

policies, and procedures. Use of University Art Galleries, visits to other museums, lecturers. Prereq: two courses in art history and permission. 4 cr.

(See also Arts 796.)

Art Education Courses

All courses elective by permission of the Department of the Arts.

791. ART EDUCATION (ELEMENTARY)
Children's creative growth as revealed through their visual expression. Development of elementary art education programs with emphasis on objectives, methods, materials, and techniques to foster that creativity. Suggested prereq: Educ 500. 4 cr.

792. ART EDUCATION (SECONDARY)
The creative process in the visual arts in relation to the development and skills of middle and high school students in the public schools; mechanics of beginning and maintaining a secondary art program; exploring resources for art education programs on the secondary level. Suggested prereq: Educ 500. 4 cr.

(See also Arts 796.)

Biochemistry (Bchm)

(For program description, see page 43.)

CHAIRPERSON: Donald M. Green
PROFESSORS: Donald M. Green, Edward J. Herbst, Miyoshi Ikawa, Samuel C. Smith, James A. Stewart
ASSISTANT PROFESSORS: Clyde L. Denis, Anita S. Klein, Thomas M. Laue

501. BIOLOGICAL CHEMISTRY
Includes an introduction to organic chemistry. Lab fee: $30. Lab. 4 cr.

656. PHYSIOLOGICAL CHEMISTRY AND NUTRITION
Mammalian biochemistry with emphasis on the human. Lab study includes procedures basic to chemical methods of medical diagnosis. Prereq: organic chemistry. Lab fee: $30.00. Lab. 4 cr.

699. SENIOR THESIS
Research in biochemistry for senior majors. 2 cr.

702. COMPARATIVE MARINE BIOCHEMISTRY
Nutrition, metabolism, and composition of marine organisms and relation to phylogeny; marine natural products. Prereq: Bchm 752 or permission. (Not offered every year.)

705. TECHNIQUES IN ENDOCRINOLOGY
Application of modern laboratory techniques to the study of hormonal and molecular mechanisms in the endocrine system. Prereq: Zool 704 or ANSc 701 or Bchm 751, 752, 753, 754 and permission. (Also offered as Zool 705.) Lab fee: $30.00. Lab. 4 cr.

751-752. PRINCIPLES OF BIOCHEMISTRY
Fundamental biochemistry; chemistry, metabolism, and biological function of nucleic acids, proteins, carbohydrates, and lipids. Prereq: organic chemistry or permission. 3 cr.

753-754. BIOCHEMISTRY LABORATORY
Must be taken concurrently with Bchm 751-752. Lab fee: $30.00. 3 cr.

760. ENZYME CHEMISTRY
Protein physical chemistry, enzyme structure, and enzyme kinetics; physical properties of enzymes and enzyme solutions in vitro and in vivo; methods of purification, structural analysis, and kinetic mechanisms. Prereq: calculus; Bchm 752;/or permission. 3 cr.

765. ADVANCED PLANT BIOCHEMISTRY
Structure, metabolism, synthesis, and regulation of cellular constituents of plants. Prereq: Bchm 752 or PlSc 762 or permission of instructor. 3 cr.

771. BIOCHEMICAL GENETICS
Mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Prereq: Bchm 752 or permission. (Also offered as Gen 771.) 3 cr.

772. INTRODUCTORY LABORATORY IN MOLECULAR GENETIC TECHNIQUES
Modern biochemical gene manipulation techniques including the genetic, physical, and enzymatic characterization of gene vectors, gene cloning, construction of genetic probes, and sequencing of nucleic acids. Prereq: Bchm 752; and either Bchm 771, Bchm 781, or Micr 704. (Also offered as Gen 772.) Lab fee: $30.00. 3 cr.

781. THE NUCLEIC ACIDS
Chemistry and metabolism of nucleic acids; molecular structures, purification and separation, biosynthesis, and biological functions. Prereq: Bchm 752 or permission. 3 cr.

795. INVESTIGATIONS IN BIOCHEMISTRY
Prereq: permission. Subject matter and hours to be arranged. Not more than 4 total credit hours can be applied to biochemistry or major electives. 1-4 cr.

Biology (Biol)

(For program description, see page 39.)

See additional course descriptions under Animal Sciences, Biochemistry, Botany and Plant Pathology, Entomology, Forest Resources, Microbiology, Plant Science, and Zoology.

401. HUMAN BIOLOGY
Elementary study of structure, function, and development of all systems of the body. No credit toward major or minor. Cannot be taken for credit after Zool 507-508. 4 cr.

402. ENVIRONMENTAL BIOLOGY
Basic interrelationships between organisms and populations and their environments; ecosystems; man's modification of his environment and its consequences. No credit toward a major or minor. Students with credit for Biol 541 cannot receive credit for Biol 402. 4 cr.

403. PRINCIPLES OF BIOLOGY
General survey of plant and animal kingdoms; elementary principles of heredity, evolution, and ecology. No credit toward a major or minor. 4 cr.

404. GENETIC BIOLOGY
Genetic basis for variation, including inheritance patterns, their chemical and physical basis, and human diversity; current technologies and issues associated with them. Biological science majors should enroll in Zool 604 or PlSc 604. 4 cr.

409. HUMAN REPRODUCTIVE BIOLOGY
Aspects of human sexuality from anatomical, physiological, and other viewpoints. No credit toward a major or minor. 4 cr.

420. PARASITES AND PESTILENCE
Ecology of human disease; role of disease in history; biological, social, and economic problems involved in eradication and control. Particular attention to diseases that still account for serious sickness and mortality in overpopulated, underdeveloped countries. No credit toward a major or minor. 4 cr.

541. GENERAL ECOLOGY
Interrelationships between organisms and their physical environment; populations, communities, the ecosystem, energy flow. Prereq: introductory chemistry; Bot 412; Zool 412; /or equivalent. 4 cr.

543. FIELD ECOLOGY
Consideration of ecological principles by inquiry in natural habitats and in the laboratory. Prereq: Math 425, statistics, or equivalent; present or prior enrollment in Biol 541; permission. Lab. 2 cr.

791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL BIOLOGY
Objectives and methods; selection and organization of materials, preparation of visual aids and other projects; use of field trips. Prereq: two years of biological science; permission. 4 cr.

Botany and Plant Pathology (Bot)

(For program description, see page 43.)

CHAIRPERSON: Subhash C. Minocha
PROFESSORS: Robert O. Blanchard, A. Linn Bogle, William E. MacHardy, Arthur C. Mathieson, Subhash C. Minocha
ADJUNCT PROFESSOR: Alex L. Shigo
ASSOCIATE PROFESSORS: Alan L. Baker, Garrett E. Crow, Leland S. Jahnke
ADJUNCT ASSOCIATE PROFESSOR: Walter C. Shortle
ASSISTANT PROFESSORS: Wayne R. Fagerberg, Thomas C. Harrington, Thomas D. Lee
ADJUNCT ASSISTANT PROFESSORS: Kathleen K. Baker, Antoinette P. Hartgerink, Frederick T. Short, Janet R. Sullivan

412. INTRODUCTORY BOTANY
All groups of plants; growth, development, and environmental responses. Lab fee. Lab. 4 cr.

503. THE PLANT WORLD
Survey of the plant kingdom. The biology and economic significance of the major groups of plants; the major trends of evolutionary specialization in the form, structure and function, and the interrelationships of the major divisions. Lab. 4 cr.

566. SYSTEMATIC BOTANY
Scientific basis of plant taxonomy and the identification and classification of major plant families, native trees, shrubs, and wild flowers. Prereq: one semester of biological science. Lab. 4 cr.

601. TERRESTRIAL PLANT ECOLOGY
Regulation of distribution and abundance of terrestrial plants by physical and biotic environmental factors; ecology of plant life history patterns; development and structure of plant communities; ecosystem structure and function. Occasional Saturday field trips. Prereq: Bot 412, or equivalent with permission. Lab. 4 cr.

606. PLANT PHYSIOLOGY
Structure-function relationship of plants, internal and external factors regulating plant growth and development, plant hormones, plant metabolism, water relations, and mineral nutrition. Prereq: Bot 412 or PlSc 421; one year of chemistry;/or permission. Coreq: Bot 608. Also offered as PlSc 606. 3 cr.

608. PLANT PHYSIOLOGY LABORATORY
Analytical techniques for plant physiology, effects of growth regulators on plant growth and development, cell and tissue culture, enzyme kinetics, and plant water relations. Coreq: Bot 606. (Also offered as PlSc 608.) Lab fee. 2 cr.

625. INTRODUCTION TO MARINE BOTANY
Life history, classification, and ecology of micro- and macroscopic marine plants, including phytoplankton, seaweed, and salt marsh plants, and the interactions between humans and marine plant communities. Occasional Saturday morning field trips. Prereq: Bot 412; a semester of biology; /or permission. Lab. 4 cr.

651. PLANT PATHOLOGY
Nature, symptomatology, etiology, classification, and control of important plant diseases. Prereq: Bot 412 or equivalent. Lab. 4 cr.

653. FOREST AND SHADE TREE PATHOLOGY
Principles, symptomatology, etiology, and control of forest and shade tree diseases. Prereq: Bot 412 or equivalent. Lab. 4 cr.

666. SUMMER FLORA OF NEW HAMPSHIRE
Study of the flora of New Hampshire with an in-depth look at the major vegetation types. Field work will include trips to study flora of forests, dunes, salt marshes, swamps, bogs, lakes, ponds, streams, and alpine. Prereq: basic botany or permission. 4 cr. (Summer Session only.)

717. GENERAL LIMNOLOGY
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of their environment; factors regulating their distribution; and the primary and secondary productivity of lakes. Prereq: Biol 541 or equivalent. 4 cr.

719. FIELD LIMNOLOGY
Principles of freshwater ecology examined in a variety of habitats; application of field instruments and computer methods used to study lakes and interpret data. Occasional Saturday field field trips. Prereq: prior or concurrent enrollment in Bot 717; permission. Lab. 4 cr.

721. THE MICROSCOPIC ALGAE
Survey of phytoplankton and periphyton in local marine and freshwater habitats. Identification, systematics, and evolution. Class and individual collection trips. Prereq: Bot 412 or 503. Lab. 4 cr.

722. MARINE PHYCOLOGY
Identification, classification, ecology, and life histories of the major groups of marine algae, particularly the benthonic marine algae of New England. Periodic field trips. Prereq: Bot 412 or 503. Lab. 4 cr. (Alternate years; offered 1987-88.)

723. MARINE ALGAL ECOLOGY
Distribution, abundance, and growth of marine plants in relation to their environment. Scheduled field trips and an independent research project are required. Prereq: Bot 722 or Zool 715 or permission. Lab. 4 cr. (Alternate years; offered 1986-87.)

724. FRESHWATER ALGAL ECOLOGY
Survey of freshwater algal habitats; physiological explanation of population models. Individual experimental projects. Prereq: Bot 717 or 721 or permission. 4 cr.

727. ALGAL PHYSIOLOGY
A survey of major topics in the physiology and biochemistry of marine and freshwater algae including: nutrition, metabolic pathways, reproductive physiology, storage and extracellular products, cell inclusions, growth and development. Prereq: plant physiology and introductory biochemistry or permission. 2 cr. (Alternate years; offered 1987–88.)

729. ALGAL PHYSIOLOGY LABORATORY
Useful laboratory techniques in studying the physiology of freshwater and marine algae. Experiments in nutrition, metabolism, pigment and enzyme analysis. Small research project required. Prereq: concurrent registration in Bot 727; permission. 2 cr. (Alternate years; offered 1987–88.)

732. CELL BIOLOGY
Relationship of cell structure to cell function, cell-to-cell communication, replication, and factors controlling cell structure. Cell interaction with its environment, and major tools used by the cell biologist to study cells. Prereq: one year of biology; intro chemistry course. 4 cr.

742. PHYSIOLOGICAL ECOLOGY
Physiological responses of plants to the physical environment; energy exchange, light and photosynthesis, water relations, and mineral nutrition. Prereq: Bot 606 or permission. Lab. 4 cr.

745. PLANT COMMUNITY ECOLOGY
Methods for analysis of biological communities; ordination and classification of communities; theoretical and empirical investigation of factors controlling community structure; theory and modeling of succession. Occasional Saturday field trips. Prereq: intro. statistics and intro. ecology (Biol 541 or Bot 601 or equivalent) Lab. 4 cr. (Alternate years; offered 1987–88.)

747. AQUATIC HIGHER PLANTS
Flowering plants and fern relatives found in and about bodies of water in the northeastern United States; extensive field and herbarium work, preparation techniques, and collections. Prereq: Bot 566. Lab. 4 cr. (Alternate years; offered 1987–88.)

750. MORPHOGENESIS
Principles of differentiation at molecular, cellular, and organismic level; internal and external factors regulating gene activity and differentiation. Prereq: Bot 606 or permission. Also offered as Zool 791J. 4 cr. (Alternate years; offered 1986–87.)

752. MYCOLOGY
Classification, identification, culturing, life histories, and ecology of parasitic and saprophytic fungi, their role in the environment and human affairs. Prereq: elementary botany. Lab. 4 cr.

754. PRINCIPLES OF PLANT DISEASE CONTROL
Epidemiology of plant diseases and relationships to cultural practices, resistant varieties, biological control and chemical control; crop loss assessment; disease forecasting; disease pest management. Prereq: Bot 651 or 653. Lab. 4 cr. (Alternate years; offered 1987–88.)

755. PLANT VIROLOGY
Characterization and replication of plant viruses; diagnosis, epidemiology and control of virus-caused diseases of plants. Prereq: plant pathology (Bot 651 or 653) or permission. 2 cr. (First seven weeks of semester in alternate years; offered 1986–87.)

757. PLANT BACTERIOLOGY
Biology of beneficial and detrimental bacteria associated with higher plants. Prereq: plant pathology, microbiology, or permission. 2 cr. (Last seven weeks of semester in alternate years; offered 1986–87.)

758. PLANT ANATOMY
Anatomy of vascular plants, emphasizing structure and development of basic cell and tissue types, and of the major plant organs. Prereq: Bot 412 or 503. Lab. 5 cr. (Alternate years; offered 1986–87).

761. PLANT GEOGRAPHY
Distribution of plants, a consideration of world vegetation types and floras, and problems of endemism with emphasis on North America; major influential factors such as geologic, climatic, edaphic, and biotic. Three Saturday field trips. Prereq: Bot 566 or permission. 4 cr.

762. MORPHOLOGY OF SEED PLANTS
Comparative form and structure of the major living and extinct groups; evolutionary modifications of the vegetative and reproductive organs, and the basic life history pattern. Prereq: Bot 503. Lab. 4 cr. (Alternate years; offered 1987–88.)

764. MICROTECHNIQUE
Methods of preserving cell and tissue structure, embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Prereq: permission. Lab. 4 cr. (Alternate years, offered 1986–87.)

771. COMPUTER APPLICATIONS IN BIOLOGY
A set of 2-credit modules. Module A, first half of semester; Module B, second half of semester. Module A prerequisite to Module B. 2–4 cr.

771A. COMPUTER APPLICATION TECHNIQUES
Methods of problem solving in biology with computer aid. Introduction to file structure and manipulation. Use of available software packages to process field or laboratory data including acquisition, storage retrieval, statistical analysis, plotting, and report generation.

771B. BIOLOGICAL PROGRAMMING IN FORTRAN
Fundamentals of FORTRAN programming including statements, arguments, functions, subroutines, and encode/decode useful in scientific programming. Design and application of FORTRAN programs for experimentation and modeling.

795-796. INVESTIGATIONS IN:
A) Systematic Botany; B) Plant Physiology; C) Plant Pathology; D) Plant Anatomy; E) Plant Ecology; F) Mycology; G) Cell Biology; H) Phycology; I) Botanical Teaching; J) Morphology; K) Cell Physiology; L) Scientific Writing; M) Microtechnique; N) Optical Microscopy; O) History of Botany. Individual projects under faculty guidance. Elective only with permission. 1–4 cr.

Chemical Engineering (Ch E)

(For program description, see page 56.)

CHAIRPERSON: Stephen S. T. Fan
PROFESSORS: Stephen S. T. Fan, Virendra K. Mathur, Gael D. Ulrich
ASSOCIATE PROFESSORS: Ihab H. Farag, Donald C. Sundberg
ASSISTANT PROFESSORS: Russell T. Carr, Arun V. Someshwar

410. SURVEY OF CURRENT ENERGY AND POLLUTION CONTROL TECHNOLOGY
Energy supply in this country and the world; conventional fuel reserves: coal, oil, natural gas; alternative sources: nuclear, solar, geothermal, etc. Forecasts and strategies to meet needs. Environmental pollution, sources, and economic and environmental impacts. Methods for pollution control. Regulatory standards for environmental protection. Prereq: good background in high school chemistry. 4 cr.

501. INTRODUCTION TO CHEMICAL ENGINEERING I
Systems of units; material balances and chemical reactions; gas laws; phase phenomena. 3 cr.

502. INTRODUCTION TO CHEMICAL ENGINEERING II
Energy and material balances for simple and complex systems with and without chemical reactions; design case studies. 3 cr.

601. FLUID MECHANICS AND UNIT OPERATIONS
Continuity, momentum, and energy equations; laminar and turbulent flow in pipes; rheology. Applications to flow in porous media, filtration, and fluidization. 3 cr.

602. HEAT TRANSFER AND UNIT OPERATIONS
Thermal properties of materials, steady-state and transient conduction and convection; radiation; applications to heat exchangers and process equipment. 3 cr.

603. APPLIED MATHEMATICS FOR CHEMICAL ENGINEERS
Mathematical modeling and analysis of chemical engineering problems. Analytical methods for first- and second-order differential equations; numerical solutions; series solutions; Bessel functions; Laplace transforms; matrix algebra. Interpretation and solution of partial differential equations. Prereq: knowledge of FORTRAN programming. Lab. 4 cr.

604. CHEMICAL ENGINEERING THERMODYNAMICS
Volumetric and phase behavior of ideal and real gases and liquids; cycles; steady-flow processes; chemical equilibrium. Lab. 4 cr.

605. MASS TRANSFER AND STAGEWISE OPERATIONS
Diffusion in gases, liquids, and solids; design and analysis of distillation, absorption, adsorption, extraction, and other stagewise equipment and operations. 3 cr.

606. CHEMICAL ENGINEERING KINETICS
Use of laboratory data to design commercial reactors. Continuous, batch, plug-flow, and stirred-tank reactors for homogeneous and catalytic multiphase reactions. 3 cr.

608. CHEMICAL ENGINEERING DESIGN
Introduction to cost engineering. Application of acquired skills to design of chemical processes. Individual, major design project required. Lab. 3 cr.

609. FUNDAMENTALS OF AIR POLLUTION AND ITS CONTROL
The origin and fate of air pollutants. Fundamentals of atmospheric meteorology, chemistry, and dispersion phenomenon. Control of air pollutants and the related equipment. Current issues. Prereq: Math 527; Chem 403-404. Lab. 4 cr.

612. CHEMICAL ENGINEERING LABORATORY I
Selected experiments in fluid mechanics, heat transfer, and unit operations. 2 cr.

613. CHEMICAL ENGINEERING LABORATORY II
Selected experiments in mass transfer, stagewise operations, thermodynamics, and kinetics. 2 cr.

695. CHEMICAL ENGINEERING PROJECT
Independent research problems carried out under faculty supervision. 2–4 cr.

696. INDEPENDENT STUDY
Prereq: permission of the adviser and department chairperson; granted only to students having superior scholastic achievement. 1–4 cr.

701. INTRODUCTION TO POLYMER ENGINEERING
Principles of polymer chemistry, polymerization kinetics, polymer rheology, and material characteristics. Design and analysis of polymer reactors, extruders, molding machines, and other forming operations. Lab. 4 cr.

705. NATURAL AND SYNTHETIC FOSSIL FUELS
Study of U.S. and foreign reserves of coal, oil, and natural gas. Petroleum processing and refining. Coal, oil shale, and tar sand. Gasification and liquefaction of coal. Lab. 4 cr.

712. INTRODUCTION TO NUCLEAR ENGINEERING
Development of nuclear reactors; binding-energy; radioactivity; elements of nuclear reactor theory; engineering problems of heat transfer, fluid flow, materials selection, and shielding; environmental impacts. 4 cr.

751. PROCESS SIMULATION AND OPTIMIZATION
Techniques for computer-aided analysis of chemical processing systems. Development of mathematical models to describe process behavior. Application of optimization techniques. Prereq: a knowledge of FORTRAN programming. Lab. 4 cr.

752. PROCESS DYNAMICS AND CONTROL
Dynamic behavior of chemical engineering processes described by differential equations; feedback control concepts and techniques; stability analysis. Lab. 4 cr.

754. GRAPHICAL, NUMERICAL, AND FINITE ELEMENT APPLICATIONS IN CHEMICAL ENGINEERING
Computational methods for solving differential equations resulting from the modeling of a process or physical phenomena. Graphical display of results of data and of curve-fitted equations. Use of interactive graphics and the solution of boundary-value problems. Applications of finite element analysis and discussion of other software available. Prereq: Ch E 603 or permission of instructor; a knowledge of FORTRAN programming. 4 cr.

772. PHYSICOCHEMICAL PROCESSES FOR WATER AND AIR QUALITY CONTROL
Origin and characterization of pollutants. Controls, including filtration, sedimentation, coagulation and flocculation, absorption and adsorption. Applied fluid mechanics, mass transfer, and kinetics. Thermal pollution, chemical treatment, oil spills on water, and aeration. Lab. 4 cr.

Chemistry (Chem)

(For program description, see page 57.)

CHAIRPERSON: Frank L. Pilar
PROFESSORS: Alexander R. Amell, Kenneth K. Andersen, N. Dennis Chasteen, Clarence L. Grant, Colin D. Hubbard, Paul R. Jones, James D. Morrison, Charles W. Owens, Frank L. Pilar, W. Rudolf Seitz, James H. Weber
ASSOCIATE PROFESSORS: Gary R. Weisman, Edward H. Wong
ASSISTANT PROFESSORS: Christopher F. Bauer, Louise H. Foley, Catherine E. Housecroft, Richard P. Johnson, Howard R. Mayne, Sterling A. Tomellini
FACULTY IN RESIDENCE, ASSISTANT PROFESSOR: W. Daniel Edwards

*401-402. INTRODUCTION TO CHEMISTRY
Elementary, broad view of chemistry; emphasizes topics related to everyday life. For students who do not intend to take any other chemistry courses, and those interested in satisfying a science requirement. Not a prerequisite for any other chemistry courses. Lab. 4 cr. (Not offered every year.)

*403-404. GENERAL CHEMISTRY
Fundamental laws and concepts applied to nonmetals, metals, and their compounds. For students who plan to take further chemistry courses. Previous chemistry recommended. Knowledge of algebra, exponentials, and logarithms required. Lab. 4 cr.

*405. GENERAL CHEMISTRY
Basic principles; atomic structure, bonding, equilibria, and thermodynamics. First course for chemistry majors. Prereq: one year of high school chemistry, algebra, and knowledge of exponentials and logarithms. Restricted to chemistry, biochemistry, physics, chemical engineering, and mechanical engineering majors. Cannot be taken for credit if credit received for Chem 403-404. Lab. 4 cr. (Honors lab available with permission.)

406. QUANTITATIVE ANALYSIS
Studies of pollution, environmental problems, and the more traditional professional work in chemistry rely heavily on a sound knowledge of analytical chemistry. Gravimetric and volumetric analysis, potentiometry, spectrophotometry, and selected separations methods. Prereq: Chem 404 or 405. Coreq: Chem 407. 3 cr.

407. QUANTITATIVE ANALYSIS LABORATORY
Gravimetric and volumetric analysis; chemical separations; potentiometry and spectrophotometry. Treatment of data, error analysis, and calculation of results. Coreq: Chem 406. 2 cr.

*409. CHEMISTRY AND SOCIETY
Elementary survey of chemistry; integrates principles and applications. For students who do not intend to take any other chemistry courses and those interested in satisfying a general education science requirement. Not a prerequisite for any other chemistry course. Lab. 4 cr.

517. QUANTITATIVE ANALYSIS
For students planning careers in medicine, dentistry, plant and animal science, nursing, oceanography, and environmental science. Volumetric methods, separations, and instrumental methods. Prereq: Chem 404 or 405. Coreq: Chem 518. 3 cr.

518. QUANTITATIVE ANALYSIS LABORATORY
Volumetric methods with an emphasis on technique; separations; and selected instrumental methods such as potentiometry, spectrophotometry, atomic absorption, and gas chromatography. Coreq: Chem 517. 2 cr.

545. ORGANIC CHEMISTRY
Introductory study of carbon compounds for those who desire a brief terminal course. Prereq: Chem 404 or 405. Coreq: Chem 546. Students receiving credit for Chem 545 may not receive credit for Chem 402, 547-548, or 651-652. 3 cr.

546. ORGANIC CHEMISTRY LABORATORY
Must be taken concurrently with 545. 2 cr.

547-548. ORGANIC CHEMISTRY
Principal classes of organic compounds, aliphatic and aromatic; class reactions and structural theory. Intended primarily for chemistry, chemical engineering, and biochemistry majors. Prereq: Chem 404 or 405; /or permission. Coreq: Chem 549-550. Students receiving credit for Chem 547-548 may not receive credit for either Chem 545 or 651-652. 3 cr.

549-550. ORGANIC CHEMISTRY LABORATORY
Must be taken concurrently with 547-548. Lab. 2 cr.

651-652. ORGANIC CHEMISTRY
Principal classes of organic compounds, aliphatic and aromatic, class reactions and structural theory. Intended primarily for pre-healing arts, biological science, and health science students. Prereq: Chem 404 or 405; /or permission. Coreq: Chem 653-654. Students receiving credit for Chem 651-652 may not receive credit for either Chem 545 or 547-548. 3 cr.

653-654. ORGANIC CHEMISTRY LABORATORY
Must be taken concurrently with 651-652. 2 cr.

663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES
Techniques and laboratory practice in the use of apparatus in many fields of science employing radiochemical operations. Prereq: general inorganic chemistry and general physics. Lab. 4 cr. (Not offered every year.)

683-684. PHYSICAL CHEMISTRY I, II
The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Prereq: Math 426; pre- or coreq: Phys 407 or 402. Undergraduates must register for 685-686 concurrently. 3 cr.

685-686. PHYSICAL CHEMISTRY LABORATORY
Measurement of thermodynamic properties, chemical kinetics, and methods of determining the structure of matter. Prereq: Math 426; pre- or coreq: Phys 407 or 402. Undergraduates must register for 683-684 concurrently. 2 cr.

696. INDEPENDENT STUDY
For exceptional students. Individual reading, writing, or laboratory work carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry. Prereq: approval of the adviser and department chairperson. Credits to be arranged.

697. CHEMICAL LITERATURE
The chemistry library as a research tool. Prereq: Chem 548 or 652. 1 cr.

698. SEMINAR
Student reports on topics of interest. Prereq: Chem 548 or 652; Chem 684. 1 cr.

699. THESIS
Year-long investigation in a selected topic, with background and experimental investigation. For chemistry majors who have completed Chem 548, 684, and 762. Required for B.S. majors. Strongly recommended for B.A. chemistry majors. Prereq: 2.50 average or permission. Lab. 8 cr.

708. RESEARCH TECHNIQUES
Lectures and laboratory to show experimental methods and interpretation of results. Typical topics are chromatography, data handling, nuclear magnetic resonance, mass spectrometry, elementary electronics, infrared and ultraviolet spectroscopy, experimental design, and X-ray. 1–4 cr.

755. ADVANCED ORGANIC CHEMISTRY
Methods of synthesis and determination of structure, including stereochemistry of complex organic compounds. Prereq: Chem 548 or 652 or equivalent. Chem majors must register for 756 concurrently. 3 cr.

756. ADVANCED ORGANIC CHEMISTRY LABORATORY
Synthesis and structural determination of complex organic compounds, techniques for the separation, determination of purity, and identification of compounds by spectroscopic and chemical means. Must be taken concurrently with 755 by Chem majors. 2 cr.

762. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS
Theory, instrumentation, and application of methods such as atomic absorption, coulometry, emission spectrography, gas and liquid chromatography, polarography, potentiometry, IR and UV-VIS absorption spectrophotometry, and mass spectrometry to chemical analysis. Prereq: Chem 406 or 517; Chem 684 as a pre- or corequisite; /or permission. Coreq: Chem 763. 3 cr.

763. INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS LABORATORY
Experimental parameters, error analysis, and applications of the methods covered in Chem 762. Coreq: Chem 762. 2 cr.

774. INORGANIC CHEMISTRY
Basic theoretical concepts and their applications to inorganic reactions and compounds. Prereq: organic chemistry; physical chemistry;/or permission. Coreq: Chem 775. 3 cr.

775. INORGANIC CHEMISTRY LABORATORY
Synthesis and characterization of inorganic compounds with an emphasis on techniques not taught in other laboratory courses. Undergraduates must take 774 concurrently. 2 cr.

776. PHYSICAL CHEMISTRY III
Application of quantum theory to atomic electron structure, spectroscopy, and molecular structure. Prereq: Chem 683-684. Lab. 4 cr.

778. CHEMISTRY OF LARGE MOLECULES
Basic chemistry of high-molecular-weight compounds, including synthetic polymers and substances occurring in living systems. Elementary aspects of the structures, syntheses, and properties of large molecules, and their roles in modern science, technology, and living systems. Prereq: one semester of organic chemistry. 4 cr. (Not offered every year.)

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* Students may receive credit for only one course from 401, 403, 405, and 409, and for only one course from 402, 404.

Civil Engineering (Ci E)

(For program description, see page 58.)

CHAIRPERSON: David L. Gress
PROFESSORS: Paul L. Bishop, Otis J. Sproul, Tung-Ming Wang
ASSOCIATE PROFESSORS: Pedro A. De Alba, Charles H. Goodspeed, David L. Gress, Paul J. Ossenbruggen
ADJUNCT ASSOCIATE PROFESSOR: Gerald Batchelder
ASSISTANT PROFESSORS: Thomas P. Ballestero, Jean Benoit, Michael R. Collins, Robert M. Henry, Nancy E. Kinner

400. CIVIL ENGINEERING LECTURES
Introduction to the profession; the civil engineer as a planner, builder, and problem solver; and the goals of the civil engineering curriculum. Lectures by faculty and visitors. Required of Ci E freshmen; open to others by permission. 0 cr. Cr/F.

505. SURVEYING
Principles of land measurements by ground and photogrammetric methods. Application of error theory to planning and adjusting engineering surveys. Conformal mapping and its applications to state plane coordinate systems. Coreq: Math 426 or permission. Lab. 4 cr.

520. ENVIRONMENTAL POLLUTION AND PROTECTION—A GLOBAL CONTEXT
An introduction to environmental science and the anthropogenic causes of environmental change. The course will stress the causes, effects, and controls of air, water, and land pollution. The ecological, economic, and engineering aspects of pollution will be discussed along with the political (both domestic and international) and legislative aspects of control. Not for Ci E majors. 3 cr.

525. MECHANICS I
An introduction to statics. Two- and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear force diagrams, friction, and virtual work. Prereq: Math 425; Math 426; Phys 407. 3 cr.

526. MECHANICS II
An introduction to strength of materials. Analysis of members under torsion, axial, shear, and bending stresses; superposition of stresses; stability of columns. Prereq: Ci E 525. 3 cr.

527. MECHANICS III
An introduction to particle and rigid body dynamics. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prereq: Ci E 525 or permission. 3 cr.

530. INTRODUCTION TO CIVIL ENGINEERING COMPUTER APPLICATIONS
Applications of the computer in civil engineering to problem solving using matrix algebra, statistics, and Monte Carlo simulation. Emphasis on use of various computer systems and software libraries. Prereq: C S 410 and 410F. 3 cr.

622. ENGINEERING MATERIALS
Structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. Micro-structure and properties of common metals, plastics, and ceramics. Prereq: Ci E 526. Lab. 4 cr.

642. FLUID MECHANICS
Properties of fluids, fluid statics, continuity, momentum and energy equations, flow resistance. Measurement of fluids. Prereq: Ci E 527. Lab. 4 cr.

643. ENGINEERING ASPECTS OF ENVIRONMENTAL POLLUTION CONTROL
An introduction to the causes and effects of environmental pollution. The application of fundamental concepts of mass and energy balance in the design and description of pollutant flow and control. The physical, chemical, and biological aspects of pollution control will be discussed. The economic and legislative aspects of pollution control will also be addressed briefly. Prereq: Chem 403-404; Math 425; 426. 3 cr.

644. WATER AND WASTEWATER ENGINEERING
Fundamental design concepts for operations and processes used in water treatment and water pollution control. Prereq: Ci E 643. 3 cr.

665. SOIL MECHANICS
Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the behavior of soils subjected to various loading conditions. Prereq: Ci E 622; Ci E 642. Lab. 4 cr.

681. STRUCTURAL ANALYSIS
Analytical stress and deflection analysis of determinate structures under static and moving load. Computer solution of beams and trusses by classical and matrix methods. Prereq: Ci E 525-526. 3 cr.

682. PROJECT PLANNING AND DESIGN
Student groups will be formed into design teams to prepare a design plan for a large scale civil engineering system including consideration of budgetary constraints, building code criteria, and environmental impacts. A final written and oral report will be prepared by each team. Prereq: senior Ci E major. 4 cr.

685. INDETERMINATE STRUCTURES
Analysis of indeterminate structures; nonprismatic members subject to static and moving loads. Solution by classical, matrix, and computer-applied methods. Prereq: Ci E 681. 3 cr.

695. CIVIL ENGINEERING PROJECTS
Independent research, under faculty guidance, of a subject of particular interest to an individual or a small group. Prereq: approval of faculty member involved. 2–4 cr.

721. PAVEMENT DESIGN
Flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prereq: Ci E 665. 3 cr.

722. PROPERTIES AND PRODUCTION OF CONCRETE
Basic principles of hydraulic cements and mineral aggregates, and their interactions in the properties

of plastic and hardened concrete; modifications through admixtures; production handling and placement problems; specifications; quality control and acceptance testing; lightweight, heavyweight, and other special concretes. Prereq: Ci E 622 or permission. 3 cr.

723. BITUMINOUS MATERIALS AND MIXTURES
Considerations of major types of bituminous materials, asphalt cements, cutback asphalts, asphalt emulsions, and tars; influence of chemical composition on physical properties; desirable aggregate characteristics for bituminous mixtures; construction techniques; current practices for determining optimum asphalt contents. Prereq: Ci E 622 or permission. 3 cr.

731. NETWORK PLANNING AND SCHEDULING
Application of critical path methods (CPM) and project evaluation review technique (PERT) to the design and control of engineering projects. Lab. 2 cr.

733. SYSTEMS ANALYSIS
Quantitative and economic techniques for optimum allocation of resources in planning and design of engineering systems. Topics include engineering economics, principles of optimization, and statistical decision analysis. Prereq: senior Ci E major. 3 cr.

734. OPTIMIZATION OF ENGINEERING SYSTEMS
Application of methods to the optimum design of structures, treatment plants, and other large-scale facilities. Topics include linear and nonlinear programming, numerical methods, and linear regression analysis. Prereq: permission. 3 cr.

740. RURAL WASTEWATER ENGINEERING
Methods for collecting and treating wastewater in small communities and rural areas. Biological and physicochemical treatment systems for small communities; land application; soil absorption; gray water treatment; and septage treatment. Prereq: Ci E 643. 3 cr.

741. OPEN CHANNEL FLOW
Energy and momentum principles in open channel flow; flow resistance; channel controls and transitions; unsteady open channel flows; convective and dispersive transportation of pollutants; and basic modeling techniques. Prereq: fluid mechanics or permission. 3 cr.

742. HAZARDOUS WASTE MANAGEMENT
A thorough examination of the hazardous waste management problem in terms of the magnitude of the problem, the regulation of hazardous wastes, hazardous waste treatment and disposal technology, siting requirements, and remedial actions required at uncontrolled dump sites. Prereq: Ci E 644. 3 cr.

743. ENVIRONMENTAL SAMPLING AND ANALYSIS
Laboratory exercises in the techniques of water, wastewater, and solid-waste sampling and analysis. Interpretation of results from pollution surveys and operation of pollution control facilities; statistics of sampling and statistical evaluation of analytical data. Prereq: Chem 403-404. Lab. 3 cr.

744. ENVIRONMENTAL LIMNOLOGY
Biological, chemical, and physical processes that occur in lakes and impoundments are explored and interpreted with respect to the cultural activities of society. Basic concepts of lake origin, morphometric and trophic status, water movement and stratification, nutrient cycling, and others. Current limnologically related problems are explored from the environmental engineering standpoint. Term projects involving laboratory and fieldwork, and readings in the current scientific literature are required. Lab. 4 cr.

745. ENGINEERING HYDROLOGY
Hydrologic cycle, probability theory related to hydrology and the design of water resources structures, flood discharge prediction, hydrograph development, hydraulic and hydrologic river routing, reservoir routing, theory of storage, reservoir operations, hydropower development, multipurpose projects. Prereq: fluid mechanics or permission. 3 cr.

746. WASTEWATER TREATMENT PLANT DESIGN
Choice of treatment units. Design of the components; preparation of a plan for a particular city that includes a suitable combination of the units previously designed. Prereq: Ci E 644. 3 cr.

747. INTRODUCTION TO MARINE POLLUTION AND CONTROL
Introduction to the sources, effects, and control of pollutants in the marine environment. Dynamic and kinetic modeling; ocean disposal of on-shore wastes, shipboard wastes, solid wastes, dredge spoils, and radioactive wastes; and oil spills. Prereq: Ci E 644 or permission. 3 cr.

748. SOLID WASTE MANAGEMENT
Basic concepts and theories of solid waste management systems, including collection and disposal methods. Incineration, sanitary landfill design, etc.; resource recovery techniques; hazardous waste management. Prereq: Ci E 643 or permission. 3 cr.

749. WATER CHEMISTRY
The application of chemical principles to the interpretation of water quality criteria and parameters and the use of chemistry in water and wastewater treatment will be discussed. The theory, applications, and the calculations of ionic equilibrium will be stressed. Major topics covered include acid/base, hydrolysis, complexation, precipitation/dissolution, and redox equilibria. The applicability of such results and kinetic principles to natural water chemistry will also be briefly discussed. Prereq: Chem 403-404 or equivalent. 3 cr.

751. TRANSPORTATION PLANNING
Transportation demand forecasting techniques applied to regional and urban situations. Calibration and use of mathematical models for forecasting land use, trip generation, trip distribution, modal choice, and trip assignment. Prereq: Math 644. 3 cr.

755. DESIGN OF WATER TRANSMISSION SYSTEMS
Pressure, sewer, and open channel system design. Theory developed for individual components to large complex systems. Topics include closed conduit flow, open channel flow, groundwater flow,

valves and meters, pump selection, system planning and layout, and system operation and maintenance. Prereq: Ci E 642 or permission. 3 cr.

756. WASTEWATER MICROBIOLOGY
Concepts of wastewater treatment microbiology. Topics include taxonomy of wastewater species; cellular chemical composition and ultrastructure of sewage microorganisms; microbial metabolism, interaction, and growth kinetics in wastewater treatment; biogeochemical cycling in polluted water; and effects of environmental parameters on wastewater microbial processes. Laboratory projects will examine these concepts. Prereq: Ci E 644 or permission. Lab. 4 cr.

757. COASTAL ENGINEERING AND PROCESSES
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave-structure interaction. Introduction to mathematical and physical modeling. Prereq: Ci E 642 or permission. 3 cr.

763. ADVANCED SOIL MECHANICS I
Current methods of determining soil strength and compressibility. Application to earth pressure, bearing capacity, slope stability, and settlement problems. Prereq: Ci E 665 or permission. 3 cr.

765. FOUNDATION ENGINEERING
Subsurface investigation, excavation problems. Selection of foundation type. Design of footings, rafts, pile foundations, bulkhead walls. Prereq: Ci E 665 or permission. 3 cr.

766. GEOLOGICAL ENGINEERING
The influence of geology in the design of foundations, underground excavations, tunnels, dams, and highways. Includes engineering properties of rocks, rock mechanics, and tunneling. Prereq: Ci E 665 or permission. 3 cr.

768. SEEPAGE ANALYSIS AND EARTH DAM DESIGN
Groundwater flow, Darcy's law, flow nets, analytical techniques, Dupuit's theory, confined flow, flow through earth and rock structures, seepage toward wells, and earth dam design. Prereq: Ci E 642; Ci E 665. 3 cr.

774. REINFORCED CONCRETE DESIGN I
Introduction to the design of reinforced concrete structural members by stress and strength theories and deflection performance. Includes beams, columns and foundations, and construction details of reinforcing. Prereq: Ci E 681. 4 cr.

782. TIMBER DESIGN
Properties and characteristics of structural woods, mechanics of wood, connection methods, design of timber members, and connections in beams, columns, and trusses, and glued laminates of wood. Prereq: Ci E 681; permission. 3 cr.

784. STRUCTURAL ANALYSIS BY MATRIX AND NUMERICAL METHODS
Unifying concept of basic structural analysis theories; matrix and numerical methods of analysis, and their application by linear graph concepts using computers. Prereq: Ci E 685. 3 cr.

785. INTRODUCTION TO STRUCTURAL VIBRATIONS
Dynamic analysis of single- and multi-degree-of-freedom systems. Simple beam and frame structures. Earthquake analysis and design. Co- or prereq: Ci E 685. 3 cr.

786. FINITE ELEMENT APPLICATIONS FOR SOLID MECHANICS
Introductory course in the use of finite element methods for solution of various solid mechanics problems. Topics include basic matrix theory, direct stiffness method of structural analysis, development of finite element theory, and modeling engineering problems with finite element modules. Prereq: C S 410; Ci E 685 or permission. 3 cr.

791. PRESTRESSED CONCRETE
Design of prestressed and post-tensioned concrete sections in flexure and shear. Prestressing systems and ultimate strength methods will be introduced. Prereq: Ci E 794 or permission. 3 cr.

793. STRUCTURAL DESIGN IN STEEL
The design of members and connections: tension and compression members, beams, plate girders; riveted, bolted, and welded joints. Introduction to plastic design of beams and frames. Prereq: Ci E 681 or permission. 4 cr.

794. REINFORCED CONCRETE DESIGN II
Design of reinforced concrete structural members by strength. Design theory including beams, beam-columns, biaxial columns, and slabs for strength and deformations. Prereq: Ci E 774. 3 cr.

795-796. INDEPENDENT STUDY
A limited number of qualified senior and graduate students will be permitted to pursue independent studies under faculty guidance. Seniors may write terminal theses reporting the results of their investigations. (May repeat.) 1–4 cr.

Classics

(See Spanish and Classics.)

Communication

(See Theater and Communication.)

Communication Disorders (Comm)

(For program description, see page 69.)

CHAIRPERSON: F. Harry Tokay
ASSOCIATE PROFESSORS: Frederick C. Lewis, F. Harry Tokay
ADJUNCT ASSOCIATE PROFESSOR: Frederick P. Murray
ASSISTANT PROFESSORS: Mary Ann Records Blount, Stephen N. Calculator
INSTRUCTOR: Yvonne Newport-Korwatch
CLINIC COORDINATOR: Yvonne Newport-Korwatch

Comm 520 is a prerequisite for all courses in the department.

520. SURVEY OF COMMUNICATION DISORDERS
Causes, diagnosis, and treatment of speech, language, and hearing disorders. 4 cr.

521. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISMS
Anatomy, physiology, neurology, and function of the mechanisms for the production and perception of speech. 4 cr.

522. THE ACQUISITION OF LANGUAGE
Review of research and theories in speech pathology, education, linguistics, and learning theory related to development of language in the normal child. 4 cr.

524. APPLIED PHONETICS
Application of the International Phonetic Alphabet to normal and clinical populations; use of broad and narrow transcriptions. Basic speech science, acoustic phonetics, and acoustic analysis of speech production. 4 cr.

530. TECHNICAL SKILLS IN SPEECH PATHOLOGY
Introduces basic skills essential to the study of communication disorders: critical reading, professional writing, objective observation, treatment program development. History, requirements, and governance of the profession. 2 cr.

631. SPEECH PATHOLOGY I
Normal development of speech and language. Research, diagnosis, and therapy procedures as applied to communication disorders, articulation, and language. 4 cr.

632. SPEECH PATHOLOGY II
Diagnosis, therapy, and counseling procedures applied to communication disorders; emphasis on cleft palate, cerebral palsy, and aphasia. Prereq: Comm 631 or permission. 4 cr.

633. AMERICAN SIGN LANGUAGE I
Introduction to the vocabulary, finger spelling, and grammatical processes of American Sign Language. Emphasis on applying basic principles of sign language, psychosocial aspects of deafness, and the deaf person as bilingual. Prereq: permission. 2 cr.

634. CLINICAL PRACTICE IN SPEECH PATHOLOGY
Supervised experiences in diagnosis and therapy with speech-handicapped children and adults. Experiences with school-age children in individual and group therapy. Prereq: Comm 524 and 632. 4 cr. Cr/F.

650. PRINCIPLES AND PRACTICE OF PUBLIC SCHOOL SPEECH THERAPY
Principles, goals, and philosophy of public school speech and language therapy. Supervised practicum. Prereq: Comm 634. Lab. 4 cr.

660. SPECIAL PROBLEMS IN COMMUNICATION DISORDERS
Individual or group projects to enrich or expand theoretical knowledge and to afford an opportunity for applied experience. Prereq: permission and arrangement with faculty. May be repeated to a maximum of 8 credits. 2, 4, 6, or 8 cr.

701. AMERICAN SIGN LANGUAGE II
Advanced phonology, syntax, and semantics of American Sign Language. Emphasis on grammatical processes that modulate meaning of signs in discourse and development of receptive language skills. Prereq: Comm 633 and permission. 2 cr.

702. AMERICAN SIGN LANGUAGE III
Emphasis on the advanced linguistic principles of American Sign Language including idioms, slang, and their place in the communication patterns of the deaf. Improvement of speed and accuracy in receptive and expressive skills for communicating with the deaf. Educational and vocational problems associated with deafness. Prereq: Comm 701 and permission. 2 cr.

704. BASIC AUDIOLOGY
Normal hearing process and pathologies of the auditory system. Hearing screening, pure-tone testing, and speech audiometry. Prereq: Comm 521 or permission. 4 cr.

705. INTRODUCTION TO AUDITORY PERCEPTION AND AURAL REHABILITATION
Research, testing, and clinical procedures of auditory perception, applied to the communicatively impaired. Prereq: Comm 704; permission. 4 cr.

706. STUTTERING
Theoretical and therapeutic considerations of the stuttering syndrome; emphasis upon clinical management. Prereq: Comm 632 or permission. 4 cr.

777. SPEECH AND HEARING SCIENCE
Physical, acoustical, and perceptual correlates of normal speech production and audition. Will include theoretical models along with the generation, transmission, detection, and analysis of speech signals. 3 cr.

780. DIAGNOSIS OF SPEECH AND LANGUAGE DISORDERS
Principles and practice for diagnosis of speech and language disorders; examination procedures and measurement techniques. Prereq: Comm 632. 4 cr.

795. INDEPENDENT STUDY
Application of the theory to specific communication disorder areas for individual or group projects. Prereq: permission. May be repeated to a maximum of 8 credits. 2, 4, 6, or 8 cr.

Community Development

(See Resource Economics and Community Development.)

Computer Engineering

(See Electrical and Computer Engineering.)

Computer Science (C S)

(For program description, see page 60.)

CHAIRPERSON: R. Daniel Bergeron
PROFESSOR: Shan S. Kuo
ASSOCIATE PROFESSORS: R. Daniel Bergeron, Eugene C. Freuder, Robert D. Russell, James L. Weiner
ASSISTANT PROFESSORS: Helen M. Gigley, Michael J. Quinn
ADJUNCT ASSISTANT PROFESSOR: Sylvia Weber Russell
INSTRUCTORS: Brian Leigh Johnson, Paul Arthur Sand

403. INTRODUCTION TO DIGITAL COMPUTER PROGRAMMING
Development of algorithms and programs. Basic programming and programming structure utilizing FORTRAN language; use of an operating system, computer solution of numerical and nonnumerical problems. Intended for chemical engineering majors. No credit toward a math or C S major. Credit cannot be received for both C S 403 and C S 410F. 2 cr.

406. INTRODUCTION TO COMPUTING
Introduces computers, their applications, and the programming process; basic problem solving using computers; overview of computer systems and major applications. Intended primarily for liberal arts and other nontechnical students who plan no further study in computer science. Equivalent to the introductory module of C S 410 for prerequisite purposes; credit not granted for both. 4 cr.

The drop/add deadline for all C S 410 courses is the second Friday of class.

410. INTRODUCTION TO COMPUTER PROGRAMMING
A set of 2-credit modules. Introductory module, first half of the semester. Other modules usually second half of the semester. Introductory module prerequisite for all other modules. Permission required to register for less than 4 credits. 2 or more cr.

410. Introductory Programming
Introduction to the concepts and techniques of computer programming. Particular emphasis is placed on good programming style. The programming language PASCAL is used.

410C. Business Programming with COBOL
Introduction to basic algorithms and techniques used in business programming. The COBOL programming language is taught and used for the programming assignments.

410F. Scientific Programming with FORTRAN
Introduction to basic algorithms and techniques used in scientific programming. The FORTRAN programming language is taught and used for the programming assignments.

410P. Advanced PASCAL Programming
Advanced features of PASCAL, including file handling, recursion, pointers, sets. Basic data structures including strings, lists, stacks, queues, and trees. Programming with data abstractions. Credit not granted for both C S 410P and C S 503. Prereq: C S 410. 2 cr.

501C. INTRODUCTION TO PROGRAMMING IN C
C language is taught and used for programming assignments. Prereq: C S 410. 1 cr. Cr/F.

503. ADVANCED PROGRAMMING TECHNIQUES
Advanced programming techniques using basic data structures including strings, lists, stacks, queues, and trees. Programming with data abstractions. Use of software tools. Credit cannot be received for both C S 410P and C S 503. Prereq: C S 410. 4 cr.

610. OPERATING SYSTEM FUNDAMENTALS
Introduction to operating system concepts and design. Job, process, and resource management; I/O programming. Hands-on use of laboratory mini- or microcomputer. Prereq: C S 410P or E E 612. 4 cr.

611. ASSEMBLER-LANGUAGE PROGRAMMING
Assembler-language coding and programming techniques. Data representation, systems organization, program segmentation, linkage of control section, manipulation of bits or bytes, and macroprogramming. Input/output using System macros. Interrupts. Prereq: C S 410; 410F. 4 cr.

612. DATA STRUCTURES AND ALGORITHMS
Review of basic data structures; advanced data structures such as graphs, B-trees, and AVL trees; abstract data structure design and programming techniques; use of a data abstraction language. Introduction to algorithm analysis. Prereq: C S 410P or C S 503. 4 cr.

671. PROGRAMMING LANGUAGE CONCEPTS AND FEATURES
Concepts of programming languages illustrated through comparison and use of various languages. Formal definition of programming languages; specification of syntax and semantics. Properties of algorithmic languages, data abstraction languages and special purpose languages for list processing and symbol manipulation; run-time representation of program and data structures. Prereq: all modules of C S 410 and C S 612. 4 cr.

696. INDEPENDENT STUDY
Projects of interest and value to student and department. Prereq: permission of faculty supervisor and department chairperson. 1–6 cr.

710. ADVANCED SYSTEMS PROGRAMMING
Topics in systems programming, including organization and implementation of assemblers, linkage editors, job schedulers, command language decoders. File systems, protection, security, performance evaluation, and measurement. Prereq: C S 610 and C S 611. 4 cr.

712. COMPILER DESIGN
Formal languages and formal techniques for syntax analysis and parsing; organization of the compiler and its data structures; problems presented by error recovery and code generation. Classical top-down and bottom-up techniques currently in widespread use, general discussion of LL(k) and LR(k) parsers; automatic methods of compiler generation and compiler compilers. Students required to define a simple, nontrivial programming language and to design and implement its compiler. Prereq: C S 671. 4 cr.

713. COMPUTER GRAPHICS
Input-output and representation of pictures from hardware and software points of view; interactive techniques and their applications; three-dimensional image synthesis techniques. Prereq: C S 610; C S 612; /or permission. 4 cr.

714. INTRODUCTION TO PROGRAMMING SEMANTICS
Informal, nonmathematical introduction to descriptive techniques of denotational semantics. Pro-

vides framework needed to describe formally programming languages such as PASCAL. No previous knowledge of the theory of computation or of any particular programming language is assumed. Prereq: C S 671; /or permission. 4 cr.

715. INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Machine intelligence, representation and control issues, search methods, problem solving, learning computer vision, natural language understanding, knowledge engineering, game playing. Heuristic programming and the LISP language. Prereq: C S 671. 4 cr.

716. DATABASE TECHNIQUES
Database analysis and design. Hierarchic, network, and relational models. Data normalization, data manipulation tools, data description languages, query functions and facilities, design and translation strategies, file and index organizations, data integrity and reliability, data security techniques, distributed database systems, actual usage of selected DBMS on computers. Prereq: C S 612. 4 cr.

753. NUMERICAL METHODS AND COMPUTERS I
Use of scientific subroutine and plotter routine packages, floating point arithmetic, polynomial and cubic spline interpolation, implementation problems for linear and nonlinear equations, random numbers and Monte Carlo method, Romberg's method, optimization techniques, finite elements. Selected algorithms programmed for computer solution. Prereq: Math 426; C S 410 and C S 410F. (Also offered as Math 753.) 4 cr.

754. NUMERICAL METHODS AND COMPUTERS II
Mathematical software. Computer solutions of differential equations; eigenvalues and eigenvectors. Prereq: Math 527; C S 410 and C S 410F. (Also offered as Math 754.) 4 cr.

758. ANALYSIS OF ALGORITHMS
Introduction to use of basic mathematics in design and analysis of computer algorithms. Topics include O-notation, divide and conquer, the greedy method, dynamic programming, and NP-completeness. Prereq: Math 531C and C S 612. 4 cr.

762. INTRODUCTION TO NATURAL LANGUAGE PROCESSING
Introduction to the problem of natural language processing as viewed within the disciplines of artificial intelligence, linguistics, psycholinguistics, psychology, and neuroscience. Topics covered include: comprehension, production, and acquisition of language; and neurological aspects of language performance. Prereq: C S 715 or permission. 4 cr.

790. TOPICS IN COMPUTER SCIENCE
Offered on an irregular basis with varying content. 4 cr.

Dance

(See Theater and Communications.)

Division of Continuing Education (DCE) Career Concentration Courses

(For program description, see page 87.)

DIRECTOR OF DIVISION OF CONTINUING EDUCATION: Edward J. Durnall

506. FIELD EXPERIENCE
Supervised work experience with planned learning objectives relating to student's career concentration. Prereq: permission. May be repeated to a maximum of 8 credits for associate in arts degree students. 1–4 cr.

519. CAREER PLANNING
Skills and methods of career planning, including integration of career and educational goals. Topics include self-assessment, occupational investigation, occupational selection and decision making, goal setting, and job search techniques. Available to associate degree students, freshmen, and sophomores; others by permission. 2 cr.

599. SPECIAL TOPICS
Occasional course offerings of specialized material in A.A. career concentrations; general studies topics for nontraditional learners; travel/study programs. Prereq: permission. 1–4 cr.

606. FIELD EXPERIENCE
Supervised work experience with planned learning objectives related to the student's major or area of concentration. May be repeated to a maximum of 4 credits for baccalaureate degree students. Prereq: permission. 1–4 cr. Cr/F.

607. FIELD EXPERIENCE IN ENGINEERING AND PHYSICAL SCIENCES
Supervised work experience with planned learning objectives related to the student's major or area of concentration. May be repeated for credits, which are in addition to degree requirements. Prereq: permission. 1 cr. Cr/F.

608. PROFESSIONAL PRACTICE
Based on an appropriate concurrent work experience, student readings, and reports to articulate the learning that takes place in the transition from college to professional employment. Deals with the appropriate attitudes, habits, and skills for success. May be repeated to 4 cr. Prereq: permission. 1–2 cr. Cr/F.

Accounting

These accounting courses are not open to UNH bachelor's degree candidates.

462-463. PRINCIPLES OF FINANCIAL ACCOUNTING
Two-semester sequence covering the principles of financial accounting. Double-entry, accrual accounting model and its application to service and merchandising firms. Accounting cycle, from the design of the system and the analysis of transactions to the final preparation of financial statements. 4 cr.

561. PRINCIPLES OF COST ACCOUNTING
Accounting for the flow of manufacturing costs in an industrial firm. Accounting for raw materials, direct labor and factory overhead, flow of costs in acquisition, work-in-progress, and finished goods to costs of goods sold. Job order and process cost systems, and concepts of standard and variance analysis. Prereq: DCE 462. 4 cr.

562. TAX PRINCIPLES AND PROCEDURES
Principles of federal, state, and local taxes; emphasis on federal income tax. Principles of taxation, tax planning, tax accounting, and the preparation of basic individual and business returns. New Hampshire and local taxes. Prereq: DCE 462. 4 cr.

563. PRINCIPLES OF MANAGERIAL ACCOUNTING
Need for and analysis of accounting data in the managerial planning and control process. Use of accounting information in the management of ongoing operations, in special nonrecurring decisions, and in long-range planning and capital budgeting. Prereq: DCE 462-463; DCE 561. 4 cr.

Computer Information Studies

These computer information studies courses (except for DCE 491, Computer Literacy) are not open to UNH bachelor's degree candidates.

490. INTRODUCTION TO COMPUTER INFORMATION STUDIES
Information system concepts and applications, including system elements, structured programming, information processing, data base management. Emphasis placed on laboratory experience to develop strong skills in interactive communications with microcomputers. Students will learn to use the computers with high-level programming languages in developing application programs. Pre- or coreq: C S 410 (410C, 410F, or 410P) or C S 406. 4 cr.

491. COMPUTER LITERACY
Provides an understanding of the components of computers and how they work; the various applications of computers and their impact on society and the individual. Emphasis on using microcomputers to write programs to solve particular problems. Not open to students who have completed Admn 526, C S 406, C S 410, E E 405, or E E 531. 2 cr.

590. INFORMATION SYSTEMS APPLICATIONS
Emphasizes hands-on experience in using microcomputers for software applications, such as word processing, data base management, accounting, decision making, spreadsheets, and business graphics. Students will use and adapt/develop software packages. Prereq: DCE 490. 4 cr.

591. INTERACTIVE SYSTEMS DESIGN
Design and implementation of integrated systems such as inventory or accounting. Topics include: human factors, file creation and maintenance using CRT on-line communications facilities, sorting, and report writing on both large and microcomputer systems. Prereq: DCE 490. 4 cr.

592. DATA BASE APPLICATIONS
Students will design and implement a management information system using a data base management system and statistical and simulation programs. Prereq: DCE 490; Math 420. 4 cr.

593. PROGRAMMING IN BASIC
Introduction to the elements of computer programming in BASIC, the most widely used microcomputer language. Students will plan, write, and successfully run a variety of programs for data manipulation. Emphasis on BASIC language statements involving nested loops, subscripted variables, string manipulation, file handling, subroutines, and structured programming techniques. Extensive hands-on microcomputer practice. Prereq: Inco/DCE 491; permission. Not open to students who have completed Admn 526, C S 410, E E 531, or Tech 465. 2 cr.

594. MICROCOMPUTER SOFTWARE APPLICATIONS
A survey of various microcomputer software packages for their personal and professional applications. Suggested topics include: word processing, data base management, electronic spreadsheets, communications programs, and a variety of other career-related software, primarily associated with the CP/M computer operating system. Extensive hands-on microcomputer practice will be featured. Prereq: Inco/DCE 491; permission. Not open to students who have completed Admn 526, C S 410, E E 531, or Tech 465. 2 cr.

595. INDEPENDENT STUDY IN COMPUTER INFORMATION STUDIES
An in-depth project for students adequately prepared by course work and/or experience will be pursued under the direction and supervision of the coordinator. Prereq: permission prior to registration. 1–4 cr.

596. TECHNICAL WRITING
Students will learn to produce both technical and nontechnical documents for applications in education, business, industry, and the home. Each student will create small manuals for critique by the instructor and the class. Topics include logical thinking and organization, interviewing skills, technical writing styles and formats, word processing/graphic programs, pasteup, color usage, cover selection/design, interfacing with a print shop, and budget analysis. Prereq: Engl 401 or 501; Inco 491. 4 cr.

597. DOCUMENTATION PRACTICUM
This independent work project stresses techniques and mechanics required to produce a highly useful, professional document. Knowledge previously acquired through courses in this program will be cultivated and applied, under the direction of a coordinator, culminating in a substantial, final product. Prereq: DCE 596 or permission. 2 cr.

Criminal Justice

550. CRIMINAL JUSTICE ADMINISTRATION AND ORGANIZATION
Contemporary methods of administrative practice for efficient use of personnel, facilities, and equipment; planning and research; budgeting and control; decision making; communications. 4 cr. (Not offered every year.)

551. CRIME PREVENTION AND CONTROL
Coordinating the efforts of the community and

criminal justice agencies. Problem solving in specific crime analysis—the offense, the offender, and community environment. 4 cr. (Not offered every year.)

552. CORRECTIONS TREATMENT AND CUSTODY
Scientific diagnosis and treatment of offenders. Institutional administration methods—climate, personnel, structure, and procedure. 4 cr. (Not offered every year.)

554. JUVENILE JUSTICE ADMINISTRATION AND ORGANIZATION
Techniques and methods of organizing and administering police juvenile units: role, function, and responsibilities of juvenile officers within the juvenile justice system. Prereq: permission. 4 cr. (Not offered every year.)

555. DELINQUENCY PREVENTION AND CONTROL
Causes of delinquency; pathogenic patterns; and diagnosis of child abuse. Prevention and treatment of child abuse and delinquency through coordination of the efforts of community and criminal justice agencies. Prereq: permission. 2 cr. (Not offered every year.)

Management

These management courses are not open to UNH bachelor's degree candidates.

430. MANAGEMENT PRINCIPLES AND ORGANIZATION
Management philosophy and practices; organization, structure, communication, planning, controlling, and decision making. 4 cr.

431. HUMAN BEHAVIOR AND SUPERVISION
Nature of people at work; leadership; informal organization; employee training and development; motivation, morale, and performance appraisal; counseling for improvement; effective supervision; employee relations. 4 cr.

432. PRINCIPLES OF ACCOUNTING
Sole proprietorship, partnership, and the corporation; recording, summarizing, and reporting data; systems to account for and control purchases, sales, cash, receivables, and inventory; valuation of assets and measurements of income. Not open to students who have had DCE 462 or the A.A. degree candidates in accounting career concentration. 4 cr.

530. ECONOMICS
U.S. economy and its component units. Macro- and microeconomic perspectives. Not open to students who have had Econ 401 or 402, or REco 411. 4 cr.

531. SALESMANSHIP
Principles and techniques of personal selling; customers' needs and satisfaction. 4 cr.

532. BUSINESS LAW
Legal theory, practice, and precedents in everyday business situations. Not open to students who have had Admn 647. 4 cr.

533. CREDIT MANAGEMENT
Credit—its effect on the money supply and its role in the economy; commercial and consumer borrowing; credit policy, analysis, and regulations; secured and unsecured credit; collections; receivables; management of credit; and decision making. 4 cr. (Not offered every year.)

534. SMALL BUSINESS MANAGEMENT ISSUES
The environment of small business. Financial planning and procedures for starting a small business; developing and establishing a marketing plan; operating a going business; franchising; and cash flow management. 4 cr. (Not offered every year.)

535. OFFICE PROCEDURES AND MANAGEMENT
Methods and procedures of traditional and modern administrative office operations; office systems, word processing, records management, staffing, and organization of work flow. 4 cr.

Merchandising

These merchandising courses are not open to UNH bachelor's degree candidates.

410. FUNDAMENTALS OF MERCHANDISING
Practices and procedures in marketing goods and services; retailing and wholesaling; channels of trade; functions of middlemen. 4 cr. (Not offered every year.)

411. PROMOTION AND ADVERTISING
Mass communication in marketing; use of advertising media; integration of promotional plans and sales techniques; evaluation of promotional efforts. 4 cr. (Not offered every year.)

510. RETAILING
Managing a goods or services retail enterprise; store location and organization, layout, buying and pricing, advertising and sales promotion, inventory control, and personnel policies. 4 cr. (Not offered every year.)

512. FASHION MERCHANDISING AND DISPLAY
Principles and procedures used in selection, promotion, and selling of fashion apparel and accessories. Analysis of principles of display. Prereq: DCE 410 or permission. 4 cr. (Not offered every year.)

Real Estate

These real estate courses are not open to UNH bachelor's degree candidates.

425. FUNDAMENTALS OF REAL ESTATE
History and development of property ownership; title and legal processes; limitations and restrictions of rights, contracts, and agreements; deeds and transfer of property. 4 cr.

426. REAL ESTATE APPRAISAL
Principles of land and building analysis, cost estimation, depreciation, and influences affecting value of residential and commercial property. Prereq: DCE 425. 4 cr. (Not offered every year.)

525. REAL ESTATE LAW
Fundamentals of real estate law; nature and classes of property; ownership; purchase and sales; and rights, duties, and responsibilities of the broker. 4 cr. (Not offered every year.)

526. REAL ESTATE FINANCE
Mortgages, loans, and financing residential and commercial property. 4 cr. (Not offered every year.)

Career Electives

These career elective courses are not open to UNH bachelor's degree candidates who entered September, 1982, or later. This rule does not apply to those who were admitted under earlier catalogs. (Not offered every year.)

401. INTRODUCTION TO LIBRARY PUBLIC SUPPORT SERVICES
History; philosophy of library service; philosophy of reference service; reference and bibliographic tools. 4 cr. (Not offered every year.)

402. ACQUISITION, CLASSIFICATION, AND CIRCULATION SYSTEMS
Acquisition and processing of materials; classification systems; technical aspects of circulation systems. 4 cr. (Not offered every year.)

420. PRINCIPLES OF INSURANCE
History, ethics, and the theory of risk. Major types of insurance. Operation and administration of an agency. 4 cr.

421. LIFE AND HEALTH INSURANCE
Insurance programs for the individual. History; types of contracts; legal concepts; and government, group, and individual programs. 4 cr.

422. PROPERTY, LIABILITY, AND MARINE INSURANCE
Fire, casualty, transportation, marine, and aircraft insurance; fidelity and surety bonds; worker's compensation; underwriting, loss adjustment, and prevention; government regulations, rate making and reinsurance. 4 cr.

440. MONEY AND BANKING
American financial system. How money is created and affects economy. Monetary policy. Pre- or coreq: DCE 530 or Econ 401. Not open to students who have had Econ 635. 4 cr.

441. BANK OPERATIONS
Cash management and control, clearing and collections operations, loan and deposit administration, internal audit, and ancillary services. Pre- or coreq: DCE 432 or 462. 4 cr.

470. INTRODUCTION TO TRANSPORTATION AND TRAFFIC MANAGEMENT
Characteristics and operations of the various modes and classes—common, contract, exempt, and private. Relationship between distribution management and other operational activites. 4 cr.

471. CARRIER OPERATIONS
Principles of freight traffic; shipper-carrier relations. Terminal operations, freight handling, dispatching, inventory controls, employee relations, and other areas related to the operation of the transportation industry. 4 cr.

480. FUNDAMENTALS OF QUALITY CONTROL
Planning, organizing, and administering quality control operations in relation to company policy and objectives. 4 cr.

501. INFORMATION SERVICES MANAGEMENT
Information services management; controlling information flow; evaluating information needs of organizations; technological planning of the transfer of information. 4 cr. (Not offered every year.)

503. CHILDREN'S LIBRARY SERVICES
Materials for children; working with children; implementing special programs; selection of materials; reference methods; audio-visual materials. 4 cr. (Not offered every year.)

540. BANK INVESTMENTS
Investment and portfolio analysis in relation to bank operations; constraints affecting liquidity, safety, and profitability; types of securities; optional timing of investment transactions. Prereq: DCE 440. 4 cr.

570. PRINCIPLES OF PHYSICAL DISTRIBUTION
Elements involved in physical distribution and their interrelationships: inventory management, warehousing, industrial packaging, materials handling, physical flow, labor relations, cost control, forecasting. 4 cr.

571. TRANSPORTATION REGULATIONS
Relationships among federal, state, and international regulatory agencies and the modes and classes of transportation. Interstate Commerce Act application and interpretation; handling and filing of claims; documentation; export-import regulations; safety requirements; and labor contracts. Prereq: DCE 470 or permission. 4 cr.

580. QUALITY CONTROL ENGINEERING
Pre-process, in-process, and post-process control techniques. Data accumulation classification, evaluation, measurement, reporting, and costs. Prereq: DCE 480 or permission. 4 cr.

581. STATISTICAL APPLICATIONS TO QUALITY CONTROL
Tendency and variation, normal curve applications, histogram analysis, control charts, sampling plans, and Dodge-Romig and Military Standard Tables. Prereq: DCE 480 or permission. 4 cr.

582. PROCUREMENT QUALITY CONTROL
Optimizing the quality of incoming materials and supplies. Quality specifications, receipt, source inspection, and vendor surveys and ratings. Prereq: DCE 480 or permission. 4 cr.

Earth Sciences (ESci)

(For program description, see page 60.)

CHAIRPERSON: Herbert Tischler
PROFESSORS: Franz E. Anderson, Francis S. Birch, Wallace A. Bothner, S. Lawrence Dingman, Henri E. Gaudette, Francis R. Hall, Paul A. Mayewski, Cecil J. Schneer, Herbert Tischler
ADJUNCT PROFESSORS: Lincoln R. Page, Eugene L. Boudette, Anthony Jack Gow
ASSOCIATE PROFESSORS: Wendell S. Brown, Jo Laird, Theodore C. Loder, III, William Berry Lyons
RESEARCH ASSOCIATE PROFESSOR: James D. Irish
ASSISTANT PROFESSOR: David A. Gust
RESEARCH ASSISTANT PROFESSOR: Mark E. Hines

401. PRINCIPLES OF GEOLOGY I
The earth; earth materials (rocks and minerals), landforms, and the processes that form them (volcanism, earthquakes, glaciation, etc.). Field trips. Lab. 4 cr.

402. PRINCIPLES OF GEOLOGY II
The geological history of the earth: an interpretation of past geologic events emphasizing the geological development of North America and the evolution of life. Prereq: ESci 401. Lab. 4 cr.

409. ENVIRONMENTAL GEOLOGY
Environmental impact of geologic processes; natural hazards—landslides, earthquakes, volcanoes, flooding, erosion, and sedimentation; land exploitation and site investigations; environmental considerations of water-supply problems; the recovery of energy and mineral resources. Lab. Students may not receive credit for both ESci 401 and ESci 409. 4 cr.

501. INTRODUCTION TO OCEANOGRAPHY
Physical, chemical, geological, and biological processes in the sea. Lab. 4 cr.

512. PRINCIPLES OF MINERALOGY I
Natural history of the solid state; introductory crystallography, diffraction, and structure of minerals. Non-silicate minerals; their chemical and physical properties, origins, occurrences, and uses. Prereq: ESci 401 or 409; Chem 401 or 403, or 405. Field trips. Lab. 4 cr.

513. PRINCIPLES OF MINERALOGY II
Silicate minerals; their chemical and physical properties, structures, origins, occurrences, and uses. Optical mineralogy. Prereq: ESci 512. Field trips. Lab. 4 cr.

531. STRUCTURAL GEOLOGY
Structural units of the earth's crust and mechanics of their formation. Prereq: ESci 402. Lab and fieldwork. 4 cr.

561. GEOMORPHOLOGY
Processes leading to the development of landforms. Field trips. Prereq: ESci 401. Lab. 4 cr.

595. SPECIAL PROJECT IN THE EARTH SCIENCES
A) Oceanography, 1–4 cr.

614. PETROGRAPHY
Description and classification of igneous, sedimentary, and metamorphic rocks in hand specimen and thin section; optical mineralogy. Prereq: ESci 513. Lab. 4 cr.

652. PALEONTOLOGY AND BIOSTRATIGRAPHY
A systematic study of major invertebrate fossil groups emphasizing their stratigraphic and paleoecologic uses. Prereq: ESci 402 or permission. Lab. 4 cr.

703. FLUVIAL HYDROLOGY
Mechanics of flows in the hydrologic cycle. Natural open-channel flows: forces, energy principles, velocity profiles, flow resistance, erosion and sediment transport, alluvial channel form, computation of flow profiles, weirs, hydraulic jumps, complete equations for stream-flow routing. Principles of porous-media flows: Darcy's law, soil physics, complete equations for ground-water and soil-water flow. Lab and field exercises. Prereq: one year each of calculus and physics. 4 cr.

705. PRINCIPLES OF HYDROLOGY
Physical principles important in the hydrologic cycle, including: basic equations, properties of water, movement of water in natural environments, formation of precipitation, relations between precipitation and streamflow, snow-melt, evapotranspiration, interception, infiltration, relations between groundwater and stream-flow, and hydrologic aspects of water quality. Problems of measurement and aspects of statistical treatment of hydrologic data. Transportation fee. Prereq: calculus. Lab. 4 cr.

710. GROUNDWATER HYDROLOGY
Principles for fluid flow in porous media with emphasis on occurrence, location, and development of groundwater but with consideration of groundwater as a transporting medium. Major topics include well hydraulics, regional groundwater flow, exploration techniques, and chemical quality. Laboratory exercises involve use of fluid, electrical, and digital computer models to illustrate key concepts. Prereq: 705 or permission. Lab. 4 cr.

725. IGNEOUS AND METAMORPHIC PETROLOGY
The origin, formation, and geologic history of igneous and metamorphic rocks as determined from field and laboratory studies of occurrences, mineral assemblages, rock composition, and texture. Interpretation of rock and mineral compositional diagrams; application of experimental investigations. Prereq: ESci 614. Field trips. Lab. 4 cr.

732. GEOLOGIC MAPPING AND INTERPRETATION
Standard methods of geologic field mapping; interpretation of geologic maps and aerial photographs of selected areas. Course includes field mapping excursions to local areas and an 8-10 day exercise in a selected area of the Appalachian Mountains. A lab fee includes transportation and housing in the field. Prereq: ESci 531 or permission. Lab. 4 cr.

734. APPLIED GEOPHYSICS
Gravity, magnetic, seismic, electrical, and thermal methods of investigating subsurface geology. Fieldwork and use of computers in data analysis. Prereq: ESci 401; one year of calculus; one year of college physics; /or permission. Lab. 4 cr.

741. GEOCHEMISTRY
Thermodynamics applied to geological processes; geochemical differentiation of the earth; the principles and processes that control the distribution and migration of elements in geological environments; stable and radiogenic isotopes in geologic processes. 4 cr.

752. CHEMICAL OCEANOGRAPHY
Water structure, chemical composition and equilibrium models, gas exchange, biological effects on chemistry, trace metals, and analytical methods. Laboratory includes short cruise aboard R/V *Jere A. Chase*. Prereq: permission. Lab (optional). 3 or 4 cr.

754. MODERN SEDIMENTS
Examines modern sediments from a process-oriented viewpoint. Emphasis will be placed on shallow water modern marine sediments including shelf, beach, and estuarine deposits. Animal/sediment interactions will be considered. Laboratory investigates applied techniques in modern sediment analysis. Prereq: ESci 401 or 501 or permission. Lab. 4 cr.

756. ESTUARINE SEDIMENTATION
Sedimentary processes occurring in an estuarine environment. Emphasis on fine-grained sediment transport, erosion, and deposition; factors affecting particulate matter transport and animal/sediment relationships. Includes participation in graduate-directed research projects. Prereq: ESci 754 or permission. Lab. 4 cr.

758. INTRODUCTION TO PHYSICAL OCEANOGRAPHY
Ocean basins; physical properties of seawater; atmosphere-ocean interaction; general ocean circulation; waves and tides; continental shelf and nearshore processes; instrumentation and methods used in ocean research. Simplified physical and mathematical models demonstrate the important concepts. Prereq: one year of calculus and college physics; introductory oceanography; /or permission. Lab and field project (optional). 3 or 4 cr.

759. GEOLOGICAL OCEANOGRAPHY
Major geological features and processes of the ocean floor; geological and geophysical methods; plate tectonics. Prereq: permission. 4 cr.

762. GLACIAL GEOLOGY
The glacial environment: glacier dynamics and glacial erosion and deposition. Review of world glacial stratigraphy in light of causes of glaciation and climatic change. Field trips. Prereq: ESci 561; /or permission. Lab. 4 cr.

763. GLACIER RESEARCH
Glaciers as proxy indicators of climatic change with specific emphasis on the interpretation of physical and chemical time series collected from glaciers. Field and laboratory work will be used as a tool in the course. Prereq: geomorphology; glacial geology; one year of college calculus; one semester each of college physics and chemistry;/or permission. 4 cr.

771. MINERAL DEPOSITS
An introduction to the processes of formation, geological characteristics, and environments of deposition of metallic mineral deposits, and a brief survey of the unique nature and importance of the mineral industries. Prereq: ESci 531; 614. 4 cr.

795. TOPICS IN EARTH SCIENCES
A) Tectonics; B) Geochemistry; C) Geomorphology, Advanced; D) Geophysics; E) Glacial Geology, Advanced; F) Groundwater Geology; G) Historical Geology, Advanced; H) Hydrology; I) Micropaleontology; J) Water Resource Management; K) Mineralogy, Advanced; L) Optical Crystallography; M) Ore Deposits; N) Paleontology, Advanced; O) Petrology, Advanced; P) Regional Geology; Q) Sedimentation; R) Stratigraphy; S) Structural Geology, Advanced; T) Marine Geology; U) Physical Oceanography; V) History of Geology; W) Earth Science Teaching Methods; X) Senior Synthesis; Y) Chemical Oceanography; Z) Glaciology, Advanced; AA) Thermodynamics in Geology. Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. 1–4 cr.

Economics (Econ)

(For program description, see page 79.)

PROGRAM DIRECTOR: Richard L. Mills
PROFESSORS: Robert F. Barlow, Manley R. Irwin, Robert C. Puth, Kenneth J. Rothwell, Dwayne E. Wrightsman
ASSOCIATE PROFESSORS: Richard W. England, Marc W. Herold, Richard W. Hurd, Richard L. Mills, Marilyn Power, Evangelos O. Simos, Allen R. Thompson
ASSISTANT PROFESSORS: Adrienne M. McElwain, Neil B. Niman, James R. Wible
FACULTY IN RESIDENCE, ASSISTANT PROFESSOR: Bernard L. Elbaum
INSTRUCTOR: Paul Wendt

400. ECONOMIC ISSUES
Economic analysis applied to current issues such as environmental pollution, federal deficit spending, monopoly and waste, poverty, racism, the energy shortage, the urban crisis, war and the economy, etc., discussed in a nontechnical, conceptual framework. Reports and discussion on outside readings. No credit toward a major or minor in economics; cannot be taken concurrently with Econ 401 or 402 or after completion of Econ 401 or 402. 4 cr.

401. PRINCIPLES OF ECONOMICS (MACRO)
Basic functions of the United States economy viewed as a whole: policies designed to affect its performance. Economic scarcity, supply and demand, the causes of unemployment and inflation, the nature of money and monetary policy, the impact of government taxation and spending, the federal debt, and international money matters. 4 cr.

402. PRINCIPLES OF ECONOMICS (MICRO)
Functions of the component units of the economy and their interrelations. Units of analysis are the individual consumer, the firm, and the industry. Theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. (Not open to students who have had REco 411.) 4 cr.

515. ECONOMIC HISTORY OF THE UNITED STATES
United States economy from colonial times to the present. Models of economic development applied to the United States. How social, political, technological, and cultural factors shape economy; development and influence of economic institutions. Prereq: Econ 401 or 402 or permission. 4 cr.

518. EUROPEAN ECONOMIC HISTORY
Western European economies from medieval times to the present. Explanations for differential growth rates and patterns; contrasts between political, social, and economic events. Prereq: Econ 401 or 402; /or permission. 4 cr.

525. INTRODUCTION TO ECONOMIC STATISTICS
Principal statistical concepts and techniques used in empirical economics: descriptive statistics, probability theory, random variables and their distributions, expected values, sampling inferential statistics, correlation and regression analysis, analysis of variance, time series analysis, index numbers. Also, principal sources of economic data. No credit for students who have had Admn 424. 4 cr.

601. INCOME DISTRIBUTION: WEALTH AND POVERTY
Examination and discussion of problems/issues of historical and current interest. Topics include comparative review of distribution systems, redistribution, poverty, the impact of inflation and taxation, normative and positive dimensions of the distribution of income and wealth. 4 cr.

602. INTRODUCTION TO POLITICAL ECONOMY
A political economic approach to economic analysis. Examines both theoretical background and current applications of political economy, including controversies among political economists. Prereq: Econ 401 and 402 or permission. 4 cr.

605. INTERMEDIATE MICROECONOMIC ANALYSIS
Analysis of supply and demand. Determination of prices, production, and the distribution of income in noncompetitive situations and in the purely competitive model. General equilibrium. Prereq: Econ 402. 4 cr.

611. INTERMEDIATE MACROECONOMIC ANALYSIS
Macroeconomic measurement, theory, and public-policy determination. Prereq: Econ 401 and 402. 4 cr.

615. HISTORY OF ECONOMIC THOUGHT
Examination and critical appraisal of the work of major economists, including the work of contemporary economists, and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prereq: Econ 401 and 402. 4 cr.

626. INTRODUCTION TO QUANTITATIVE ECONOMICS
Development of the concept of a simple, testable economic model of explanatory or forecasting type. Alignment of the model with reality by means of computer-performed statistical estimation. Types of error, consequences, and possible methods of dealing with errors. Prereq: Econ 525. 4 cr.

630. COMPARATIVE STUDY OF ECONOMIC SYSTEMS
Theoretical models of capitalism and socialism. Their historical implementation as exemplified by the United States, France, Yugoslavia, U.S.S.R., China, and Cuba. Prereq: Econ 401 and 402. 4 cr.

635. MONEY AND BANKING
Financial markets, financial institutions, monetary theory, monetary policy, causes and cures of inflation and related problems. Prereq: Econ 401 and 402. 4 cr.

641. PUBLIC FINANCE
Alternative prescriptions and explanations concerning the role of government in contemporary market economies. General principles of public expenditure analysis. Selected case studies of public spending programs; e.g., welfare, defense, education. Analysis of various federal, state, and local taxes. Prereq: Econ 401 and 402; or permission. 4 cr.

645. INTERNATIONAL ECONOMICS
Trade theory and commercial policy. Free trade, protection, common markets. Economic aspects of international relations, with particular reference to recent policy issues. Prereq: Econ 401 and 402. 4 cr.

651. GOVERNMENT REGULATION OF BUSINESS
Mergers, competition, monopoly, and the regulated industries. 4 cr.

655. LABOR UNIONS AND THE WORKING CLASS
Workers' role in the economy and the unions they form to protect their interests. History of the American labor movement; evaluation of the success of unions in fulfilling workers' needs. Management's relationship with workers in the context of a power struggle between unions and managers. Government's role in collective bargaining as intermediary and as employer. 4 cr.

656. LABOR ECONOMICS
Functioning of labor markets from theoretical and policy perspectives. Labor supply, wage determination, internal labor markets, and barriers to upward labor market mobility. Poverty, unemployment, inflation, and wage-price controls. Prereq: Econ 401 and 402; /or permission. 4 cr.

658. WOMEN AND WORK
Women's experience as workers. Significance for the economy of their work in the labor force and their unpaid labor in the home. Emphasis on the U.S., with some attention to socialist and less-developed countries. Readings contrast different theoretical approaches. Prereq: Econ 401; Econ 402; /or permission. 4 cr.

668. ECONOMIC DEVELOPMENT
Analysis of problems and available solutions confronting the underdeveloped areas of the world. Prereq: Econ 401 and 402. 4 cr.

670. ECONOMICS OF ENERGY
Concerned with the availability and use of inanimate energy resources and their relation to economic activity. Investigates energy demand, energy supply, the relation of energy to economic growth, and energy policy. Prereq: Econ 605 or permission. 4 cr.

695-696. INDEPENDENT STUDY
Individual research projects that are student designed. Initial sponsorship of an Economics faculty member must be obtained, and approval of WSBE adviser and dean. For juniors and seniors in high standing. Variable (in multiples of 2) 2–12 cr.

698. TOPICS IN ECONOMICS
Special topics. May be repeated. Prereq: permission. 4 cr.

711. ECONOMIC FLUCTUATIONS
Recurrent movements of prosperity and depression; emphasis on causes and public-policy implications. Prereq: Econ 611 or permission. 4 cr.

715. MARXIAN ECONOMIC ANALYSIS
Marx's analysis of capitalism within the classical and radical tradition; methodology; organization of capital; labor theory of value; accumulation of capital; growth and distribution; economic crises. Critical evaluation of Marx's analysis. Prereq: Econ 605 and 611; /or permission. 4 cr.

720. U.S. ECONOMIC HISTORY
From colonial times to the present. Applied economic theory; economic models and interpretation of data. Influence of technology, industrialization, foreign trade, monetary factors, and government; noneconomic factors. Prereq: Econ 605 and 611; /or permission. 4 cr.

727. ADVANCED ECONOMETRICS
Provides familiarity with standard proofs and propositions of theoretical econometrics and develops competence in the application of relatively advanced econometric techniques. Use of computer required. Prereq: permission. 4 cr.

735. ECONOMICS OF FINANCIAL MARKETS
Economic analysis of financial market systems. Topics include financial market functions, theories of saving and investment, financial intermediation, flow-of-funds analysis, loanable funds theory, interest rate forecasting, portfolio theory, capital-asset pricing models, structure of interest rates (including term-structure theory), and macroeconomic models of the financial sector. Prereq: Econ 635. 4 cr.

736. SEMINAR IN MONETARY THEORY AND POLICY
Contemporary developments in monetary theory and the evaluation of policy measures. Prereq: Econ 635. 4 cr.

737. DECISION THEORY AND BAYESIAN METHODS
Utility, decision problems, prior and posterior distributions, sufficiency, estimation and hypothesis testing, linear models and sequential sampling. Emphasis on applications to business and economics. Prereq: Math 735. (Also offered as Math 737.) 4 cr. (Not offered every year.)

745. INTERNATIONAL TRADE
Contemporary issues in international economic theory and policy. Analysis of trade theory, dynamics of world trade and exchange, and international commercial policy. Prereq: Econ 645. 4 cr.

746. INTERNATIONAL FINANCE
International monetary mechanism; balance of payments, international investment; exchange rates, adjustment systems, international liquidity, foreign aid, multinational corporations. Prereq: Econ 401 and 402. 4 cr.

747. MULTINATIONAL ENTERPRISES
Internationalization of economies. Growth and implications of multinational corporations at the level of systems. Theories of imperialism, international unity/rivalry; theories of direct investment, exercise of influence and conflict, technology transfer, bargaining with host country; effects on U.S. economy. Prereq: permission. 4 cr.

752. TECHNOLOGY, INFORMATION, AND PUBLIC POLICY
This course examines the U.S. as a post-industrial economy. The course surveys the impact of microelectronics upon manufacturing, distribution, employment, and competition. Finally, the course explores both domestic and international policy implications of information transfer. 4 cr.

755. COLLECTIVE BARGAINING
Historical development of the U.S. labor movement and the industrial relations system. Contemporary collective bargaining issues; the role of public policy in industrial relations. 4 cr.

756. LABOR ECONOMICS
Recent developments in labor market analysis and public policies related to contemporary labor issues. Labor supply, the structure and stratification of labor markets, economic discrimination, unemployment and poverty, inflation, and wage-price controls. Prereq: Econ 656. 4 cr.

757. ECONOMICS OF WORK
Organization of work under capitalism. Competing management philosophies; response of workers to management practices. Satisfaction of workers with their jobs, trends in worker productivity, alternative work arrangements, and worker participation in management. Prereq: Econ 655 or Econ 656 or permission. 4 cr.

758. LABOR MARKET MODELING
Labor supply and demand forecasting models. Demographic projections of supply. Industrial, occupational projections of demand. Simulation models for analyzing the impact of manpower and welfare programs. Use of the computer involved in doing assigned exercises, but no prior familiarity with computers is required. Prereq: permission. 4 cr.

768. SEMINAR IN ECONOMIC DEVELOPMENT
An advanced reading seminar. Topics include methodologies underlying economic development theory; industrialization and post-import substitution; state capitalist development; stabilization policies; appropriate technologies; the capital goods sector; agricultural modernization schemes; and attempts at transition to socialism. Prereq: permission. 4 cr.

769. CASE STUDIES IN ECONOMIC DEVELOPMENT
A) Southeast Asia; B) Cost-Benefit and Project Analysis; C) Africa; D) Latin America; E) Middle East. Problems and policies in selected countries; evaluations of national plans, programs, and projects; comparative analysis. Prereq: Econ 401 and 402; /or permission. 4 cr.

798. ECONOMIC PROBLEMS
Special topics; may be repeated. Prereq: permission of adviser and instructor. 2 or 4 cr.

Education (Educ)

(For program description, see page 23.)

CHAIRPERSON: Roland B. Kimball
PROFESSORS: Michael D. Andrew, Angelo V. Boy, Donald H. Graves, Richard H. Hersh, Roland B. Kimball, Carleton P. Menge
ASSOCIATE PROFESSORS: Richard F. Antonak, Charles H. Ashley, John J. Carney, John G. Chaltas, Ellen P. Corcoran, Ann L. Diller, David D. Draves, Edward J. Durnall, Susan D. Franzosa, Jane A. Hansen, David J. Hebert, Bruce L. Mallory, Sharon N. Oja, M. Daniel Smith, Deborah E. Stone, Dwight Webb, Mary Bowes Winslow
ADJUNCT ASSOCIATE PROFESSOR: Richard H. Goodman
ASSISTANT PROFESSORS: Janet Elizabeth Butcher, Grant L. Cioffi, Judith A. Kull, Richard L. Schwab, William L. Wansart
FACULTY IN RESIDENCE: Craig F. Fiedler, Mary T. Mercier

410. WOMEN AND EDUCATION
Examination and analysis of women's educational experience. Study of contemporary and historical processes and structure for educating girls and women. Review and discussion of current research in the education of women, issues of discrimination, and equity and alternative strategies for restructuring society's curriculum for the female. 4 cr.

500. EXPLORING TEACHING
For students considering a teaching career. In-school experiences to develop introductory skills in observation and teaching. On-site seminars for analysis and evaluation. Assessment and advising related to teaching as a career. Prerequisite for further work toward teacher certification. A minimum of seven hours a week, plus travel time, required. Prereq: permission. 4 cr. Cr/F.

611. TEACHING ELEMENTARY SCHOOL SOCIAL STUDIES
Objectives, content, methods, and materials. (Offered in Division of Continuing Education only.) 4 cr.

612. TEACHING ELEMENTARY SCHOOL MATHEMATICS
Objectives, content, methods, and materials. (Offered in Division of Continuing Education only.) 4 cr.

613. TEACHING ELEMENTARY SCHOOL SCIENCE
Involvement with strategies; inquiry and discovery approaches compared with more conventional methods; selection and justification of goals. Survey of resources available for science teachers; analysis of current curriculum projects. (Offered in Division of Continuing Education only.) 4 cr.

691. SCIENCE CURRICULUM AND INSTRUCTION
For inservice and preservice secondary teachers of physics, chemistry, earth science, or general science. Modern curricula and methods; contemporary programs of national interest. Science teaching goals and methods. 4 cr.

694. COURSES IN SUPERVISED TEACHING
Supervised Teaching of Physical Education. 8 cr. Cr/F. Supervised Teaching of Vocational/Technical and Adult Education. 8 cr. Cr/F. Supervised Teaching of Home Economics. 8 cr. Cr/F. Supervised Teaching of Music. 8 cr. Cr/F. Supervised Teaching of Mathematics. 8 cr. Cr/F.

700. EDUCATIONAL STRUCTURE AND CHANGE
A) Educational Structure and Change; B) Education in America: Backgrounds, Structure, and Function; C) Governance of American Schools; D) School and Cultural Change; E) Teacher and Cultural Change; F) Social Perspectives of Conflict in the Schools; G) Nature and Processes of Change in Education; H) What Is an Elementary School?; I) Schooling for the Early Adolescent; J) Children with Special Needs: Historical and Institutional Aspects; K) Curriculum Structure and Change; L) Stress in Educational Organizations. Organization, structure, and function of American schools; historical, political, and social perspectives; nature and processes of change in education. Two- and 4- credit courses offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 credits required for teacher certification. Prereq. for teacher certification students: Educ 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

701. HUMAN DEVELOPMENT AND LEARNING: EDUCATIONAL PSYCHOLOGY
A) Human Development and Learning: Educational Psychology; B) Human Development: Educational Psychology; C) Human Learning: Educational Psychology; D) Developmental Bases of Learning and Emotional Problems; E) Learning Theory, Modification of Behavior, and Classroom Management; F) Cognitive and Moral Development; G) Evaluating Classroom Learning; H) Deliberate Psychological Education; I) Sex Role, Learning, and School Achievement; J) The Development of Thinking. Child development through adolescence, learning theory, cognitive psychology, research in teaching and teacher effectiveness, and evaluation, all applied to problems of classroom and individual teaching and therapy. Full 4-credit course and 2-credit minicourses offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minicourses emphasize either development (first half of semester) or learning (second half). Candidates for teacher certification are required to have at least 2 credits of development and 2 credits of learning, or the full 4-credit course (701A). Prereq. for teacher certification students: Educ 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

703. ALTERNATIVE TEACHING MODELS
A) Alternative Teaching Models; B) Curriculum Planning for Teachers; C) Alternative Strategies for Maintaining Classroom Control; D) Nature and Goals of Social Studies: K-12; E) Social Studies Instructional Materials: K-12; F) Teaching Elementary and Middle School Science; G) Language Arts for Elementary Teachers; H) Experiential Curriculum; I) Children with Special Needs: Teaching Strategies for the Classroom Teacher; J) Writing across the Curriculum; K) Learning and LOGO. Basic teaching models, techniques of implementation, and relationships to curricula. Two- or four-credit courses offered each semester (listed in de-

partment prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 credits required for teacher certification. For secondary teacher candidates, the appropriate methods course, taught in the department of the major, usually satisfies this requirement. Educ 703B is required for candidates for elementary teacher certification who do not complete 703C, D, F, or G. Prereq. for teacher certification students: Educ 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

705. ALTERNATIVE PERSPECTIVES ON THE NATURE OF EDUCATION
A) Contemporary Educational Perspectives; B) Controversial Issues in Education I; C) Ethical Issues in Education; D) Concepts of Teaching: Differing Views; E) Curriculum Theory and Development; F) Readings on Educational Perspectives; G) Philosophy of Education; I) Education as a Form of Social Control; K) Schooling and the Rights of Children; L) Education, Inequality, and the Meritocracy; M) Readings in Philosophies of Outdoor Education; N) Alternative Perspectives on the Nature of Education; O) Classrooms: The Social Context; P) Teaching: The Social Context; Q) School and Society. Students formulate, develop, and evaluate their own educational principles, standards, and priorities. Alternative philosophies of education; contemporary educational issues. Variable credit modules offered each semester (listed in department prior to preregistration; refer to *Time and Room Schedule*). Minimum of 4 credits required for teacher certification. Prereq. for teacher certification students: Educ 500 and permission, which is accomplished by signing the appropriate course roster in the Teacher Education Office. Prereq. for students not seeking teacher certification: permission, as described above. 2 or 4 cr.

706. INTRODUCTION TO READING INSTRUCTION IN THE ELEMENTARY SCHOOLS
Reading process; current procedures and materials; diagnostic techniques; practicum experience. Course satisfies reading requirement for prospective elementary teachers in the five-year teacher education program and may be included in the 12 required graduate credits in education at the graduate level. Course may also be taken for undergraduate credit before entrance into fifth year; in this case the course satisfies reading requirement but is not applicable toward the 12 required graduate credits. Prereq: Educ 500. 4 cr.

707. TEACHING READING THROUGH THE CONTENT AREAS
Approaches and methods of teaching reading through content materials; coursework includes practical applications through development of instructional strategies and materials. 2 cr.

720. INTRODUCTION TO COMPUTER APPLICATIONS FOR EDUCATION
Examination of major issues related to classroom computer applications: historical development, computer functioning, methods of introduction, problem solving, educational software development and evaluation, conducting technological needs assessments in the schools, psychological and sociological impact of the computer on children and learning. Introduction to the classroom applications of programming languages, BASIC and Logo, and the authoring language, PILOT. Design and implementation of computer-assisted educational exercises. Hands-on sessions. No prerequisites. 4 cr.

733. INTRODUCTION TO THE TEACHING OF WRITING
The development of writers from child to adult; ways to respond to writing; organization of the classroom for the teaching of writing. Prereq: permission. 4 cr.

734. CHILDREN'S LITERATURE
Interpretive and critical study of literature for children in the elementary, middle, and junior high schools. Methods of using literature with children. 4 cr.

741. EXPLORING MATHEMATICS WITH YOUNG CHILDREN
A laboratory course offering those who teach young children mathematics and who are interested in children's discovery learning and creative thinking an opportunity to experience exploratory activities with concrete materials. It offers, on the adult level, mathematical investigations through which one may develop the ability to provide children with a mathematically rich environment, to become adept at asking problem-posing questions, and to establish a rationale for so doing. 4 cr.

742. THE YOUNG GIFTED CHILD
Identification and teaching of young gifted children (preschool through primary). Considers historical perspectives, issues, exemplary models of gifted education, multiple teaching strategies, and relevant materials. Of interest to pre-service and in-service teachers, parents, and advocates for the gifted. 4 cr.

750. INTRODUCTION TO EXCEPTIONALITY
Social, psychological, and physical characteristics of exceptional individuals including intellectual (gifted, retarded, learning disabled); sensory (visual, auditory); motor (orthopedic); health; and communication. Implications for educational and human service delivery. 4 cr.

751. EDUCATING EXCEPTIONAL LEARNERS
Issues in special education (labeling, mainstreaming, efficacy): techniques of special teaching (referral, assessment, observation, task analysis, profiling, selecting materials, intervention). Issues in special teaching (behavior modification, ability training). Primary application to mild and moderate handicaps. Co- or prereq: Educ 750 or permission. 4 cr.

752. DIAGNOSIS AND REMEDIATION OF LEARNING DISABILITIES
Terminology, etiology, common characteristics, and symptoms; theory and practice in gross-motor, visual, and auditory remediation; testing procedures used in diagnosis and remediation programs. 4 cr.

753. TEACHING CHILDREN WITH BEHAVIOR DISORDERS
Nature and scope of emotional disturbances and social maladjustment in children, including causes,

characteristics, treatment implications, and educational problems. 4 cr.

755-756. DIAGNOSTIC-PRESCRIPTIVE TEACHING OF EXCEPTIONAL LEARNERS
A two-semester course to develop teacher competence to analyze learners and learning environments, specify learner characteristics, and prescribe, implement, and evaluate special educational interventions. Applications in the areas of language, mathematics, reading, science, social studies, perceptual-motor, behavioral, adaptive, and social skills. Focus on mildly and moderately handicapped children in regular class and resource room. Prereq: Education 750 or 751 or 700J or 703I or permission. 4 cr.

758. PROGRAM DEVELOPMENT AND ADMINISTRATION IN DEVELOPMENTAL DISABILITIES
Analysis and application of techniques for program development and administration, including grantsmanship, program planning, staff supervision, program evaluation, fiscal management, and statutory issues. Focus on programs for disabled infants and adults. Prereq: permission. 4 cr.

760. INTRODUCTION TO YOUNG CHILDREN WITH SPECIAL NEEDS
The needs of children (birth to eight years) with handicaps or who are at-risk for handicaps. Strengths and special needs of handicapped children; causes, identification, and treatment; current legislation; parent and family concerns; program models. 4 cr.

763. INTRODUCTION TO EDUCATIONAL MEDIA
Educational media in the learning process; curricular integration of materials and equipment in the school library media center; design and implementation of learning systems that provide a framework for the development of individual skills. 4 cr.

764. TELEVISION AND THE YOUNG CHILD
Emergence of television as a cultural force; impact on development of the young child: physical, social, emotional, intellectual; past and present research studies; helping parents, teachers, and children become better television consumers; planning alternatives for more positive use of television technology. 4 cr.

775. DIAGNOSTIC TEACHING OF READING
Classroom implementation of diagnosis and remediation of reading difficulties; for teachers, counselors, administrators, and other school personnel. 4 cr.

776. READING FOR CHILDREN WITH SPECIAL NEEDS
Techniques and procedures for teaching reading to children with special learning needs: the mentally retarded; learning disabled; gifted, culturally diverse. Emphasis will be placed on the implications of providing reading instruction in the least restrictive alternative. 4 cr.

785. EDUCATIONAL TESTS AND MEASUREMENTS
Theory and practice of educational evaluation; uses of test results in classroom teaching and student counseling; introductory statistical techniques. 4 cr.

795, 796. INDEPENDENT STUDY
Juniors and seniors only, with approval by appropriate faculty member. Neither course may be repeated. 2 or 4 cr.

797. SEMINAR IN CONTEMPORARY EDUCATIONAL PROBLEMS
Issues and problems of special contemporary significance, usually on a subject of recent special study by faculty member(s). Prereq: permission. May be repeated for different topics. 1–4 cr.

Electrical and Computer Engineering (E E)

(For program description, see page 61.)

CHAIRPERSON: John L. Pokoski
PROFESSORS: Fletcher A. Blanchard, Jr., Ronald R. Clark, Albert D. Frost, Joseph B. Murdoch, John L. Pokoski, Kondagunta Sivaprasad
ADJUNCT PROFESSOR: Sidney W. Darlington
ASSOCIATE PROFESSORS: Allen D. Drake, Glen C. Gerhard, Filson H. Glanz, L. Gordon Kraft, John R. LaCourse, Donald W. Melvin, W. Thomas Miller III, Paul J. Nahin
ASSISTANT PROFESSORS: Kent Chamberlin, Richard A. Messner, Andrzei Rucinski
INSTRUCTOR: John E. Bates

405. INTRODUCTION TO COMPUTER TECHNOLOGY
Technical aspects of computer technology will be introduced. The emphasis will be on hardware, but software and applications will also be examined, and the potential benefits and limitations of computers will be discussed. The laboratory will include hands-on experiences with digital systems and small computers. No credit subsequent to C S 406, C S 410 or E E 543. Lab. 4 cr.

431. SPEECH, MUSIC, AND NOISE: THE SCIENCE OF SOUNDS
Physical nature of sound waves. Production of sounds by mechanical vibration in string instruments, drums, loudspeakers, or by air column resonances in horns and organ pipes. Characteristics of hearing; human perception of sound, loudness, pitch, and intensity. Speech communication and the acoustics of the classroom, theater, or concert hall. Noise, its control and reduction; criteria for the judgment of annoyance. Application of acoustics and noise control for environmental protection and in industry, transportation, biology, and medicine. Amplification, storage, and reproduction of sound. Open for credit to nonengineering and nonphysics students only. Prereq: high school mathematics. Lab. 4 cr.

432. LIGHT: SOURCES AND USES
Edison's lamp to the laser; production of light; color, the spectrum, and the human eye; sources of light; lenses and reflectors; the four factors of seeing; daylighting, energy, designing lighting in-

stallations. Lighting applications in interior spaces and outdoors. Open for credit to nonengineering and nonphysics students only. Prereq: high school algebra, trigonometry, and physics, or college courses in these. Lab. 4 cr.

535. CIRCUITS AND SIGNALS
Circuit elements, signal waveforms, circuit laws and theorems, transfer functions, Laplace transforms, free, forced, and steady-state responses, power. Non-E E majors only. Prereq: Math 426; Phys 408. Lab. 4 cr.

536. ELECTRONICS AND ELECTROMAGNETICS
Semiconductor diode and transistor theory and application, amplifiers and frequency response, magnetic fields and circuits, three-phase, transformers, DC machines. Non-E E majors only. Prereq: E E 535. Lab. 4 cr.

541. ELECTRICAL CIRCUITS
Linear passive circuit theory. Circuit element characteristics. Fundamental circuit laws, equivalent circuits, power and energy relations, mesh and node analysis applied to resistive circuits. Transient and steady-state circuit analysis using Laplace Transform techniques, steady-state phasor AC circuit analysis. For E E majors only. Prereq: Math 426; pre- or coreq: Phys 408. Lab. 4 cr.

543. INTRODUCTION TO DIGITAL SYSTEMS
Fundamental analysis and design principles. Number systems, codes, Boolean algebra, and combinational and sequential digital circuits. Lab: student-built systems using modern integrated circuit technology. Lab. 4 cr.

544. ENGINEERING ANALYSIS
Review of infinite series and multiple integrals. Differential calculus of functions of several variables. Vector differential and integral calculus with applications to electrostatics and magnetostatics. Prereq: Math 527. 3 cr.

548. CIRCUITS AND ELECTRONICS
Continuation of Electrical Circuits, including power in AC circuits, frequency response, and resonance. Linear active circuit theory. Topics include semiconductor devices and applications, bias design, amplifier behavior and modeling, special amplifiers, and amplifier frequency response. Prereq: E E 541. Lab. 4 cr.

603. ELECTROMAGNETIC FIELDS AND WAVES I
Maxwell's equations in integral and differential form with applications to static and dynamic fields. Uniform plane waves in free space and material media. Boundary conditions; simple transmission line theory; parallel plate and rectangular waveguides; simple radiating systems. Prereq: Math 527; Phys 408; E E 544 or equivalent. 3 cr.

612. COMPUTER ORGANIZATION
Basic computer structure, including arithmetic, memory, control, and input/output units; the tradeoffs between hardware, instruction sets, speed, and cost. Laboratory experiments involving machine language programming and I/O interfacing using microcomputers. Prereq: C S 410; E E 543; permission. Lab. 4 cr.

617. JUNIOR LABORATORY I
Application of laboratory instrumentation to the investigation of active and passive circuit characteristics; introduction to computer-aided design, analysis, and testing; development of report writing skills. Coreq: E E 651; E E 645. 2 cr.

618. JUNIOR LABORATORY II
Laboratory exercises in the design and analysis of active circuits, techniques of signal processing, and the properties of distributed circuits. Continued development of report writing skills. Prereq: E E 617. Coreq: E E 603. 2 cr.

620. ELECTRONICS AND INSTRUMENTATION
For nonengineering and nonphysics students; no mathematical or engineering detail. Techniques for using electronic instruments and equipment. DC and AC circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. Prereq: junior standing. 4 cr.

645. ELECTRICAL NETWORKS
Two ports and transfer functions, time and frequency domain concepts, Fourier series and transforms, state equations, convolution, introductory network synthesis, passive and active filter design, and approximation. Prereq: E E 541. 3 cr.

646. PROBABILITY AND DISCRETE SYSTEMS
Emphasis on applied engineering concepts including probability, difference equations and discrete state models, z transforms, sampling, digital filters and discrete Fourier analysis. Prereq: E E 544; E E 645; Math 527. 3 cr.

651. ADVANCED ELECTRONICS I
Small signal, power, and differential amplifiers; feedback theory, analysis, and design. Sinusoidal oscillators and analog circuits. Analysis of switching circuits. Prereq: E E 543; E E 548. 3 cr.

652. ADVANCED ELECTRONICS II
Semiconductor physics; discrete devices beyond the BJT and FET; practical limitations in operational amplifier circuits and operational amplifier configurations; interfacing; transducers; signal amplification and processing. Prereq: E E 651. 4 cr.

656. ELECTROMECHANICAL DEVICES
Magnetic circuits, theory and analysis of transformers, rotating machines, transducers and control system components, and other energy conversion methods. Prereq: E E 603; E E 548. Lab. 3 cr.

681. TEACHING EXPERIENCE
Credit for assisting in the instruction of undergraduate laboratories. Available on a limited basis to students selected by the department chairman. May be repeated for credit up to a total of 4 credits. 1 cr.

691, 692. ELECTRICAL AND COMPUTER ENGINEERING SEMINAR
Includes periodically scheduled seminars presented by outside speakers and UNH faculty and graduate students. Topics will be in general areas of interest to electrical, electronics, and computer engineers. 1 cr. Cr/F.

695. ELECTRICAL ENGINEERING PROJECTS
Laboratory or advanced study course. Students either join a department research project or engage in a project in an area of staff interest. Prereq: acceptance by staff member. 1–4 cr.

700-level courses are offered subject to adequate student demand.

704. ELECTROMAGNETIC FIELDS AND WAVES II
Loop antennas; aperture and cylindrical antennas; self and mutual impedence; receiving antennas and antenna arrays; bounded plane waves; rectangular and cylindrical waveguides; waveguide discontinuities and impedence matching; solid state microwave sources. Prereq: E E 603. 4 cr.

705. SEMICONDUCTOR DEVICES
Physical theory of semiconductors: models of solids, electronic properties, energy bonds, transport processes. PN junction theory, bipolar and field effect transistors, charge transfer devices, optoelectronic devices, integrated devices, and device fabrication technology. Prereq: Phys 505; E E 651; E E 603. 4 cr.

711. DIGITAL SYSTEMS
Advanced switching theory techniques; digital design tools; design of microprocessor-based systems; general design procedures, including top down design techniques, documentation, noise reduction, etc. Prereq: E E 612; permission. Lab. 4 cr.

712. MICROCOMPUTER SYSTEM DESIGN
Further development and application of concepts introduced in E E 711. Each student will design, build, test, and evaluate a microprocessor-based system using state of the art microcomputer development tools. Classroom emphasis will be on creative design techniques, troubleshooting strategies, and current microcomputer technology. Students will make oral presentations and write formal engineering reports. Prereq: E E 711; permission. Lab. 4 cr.

714. MINICOMPUTER APPLICATIONS ENGINEERING
Organization and operation of minicomputer-based systems. Interfacing of special purpose peripherals, digital filters, system simulation, program and data organization, priority interrupt processing of tasks, real-time monitor systems. Applications to communication, automated-measurement, and process-control systems. Prereq: E E 612; programming experience; permission. Lab. 4 cr.

727. POWER SYSTEMS
Modeling and planning of electric power transmission systems. Prereq: E E 656; E E 645; permission. 4 cr.

741. FLUID CONTROL SYSTEMS
Mathematical modeling of hydraulic, pneumatic, and fluidic control elements and control systems. Methods for 1) analysis of systems using gases or liquids as the working fluid; 2) synthesis of the parameters of the control elements used in automatic control systems; 3) design of these systems. (Also offered as M E 741.) 4 cr.

745. FUNDAMENTALS OF ACOUSTICS
Acoustic wave equation for air; laws of reflection, refraction, and absorption; characteristics and measurement of acoustical sources; human perception of sound, loudness, intensity; microphones; acoustical materials; problems in environmental sound control; ultrasonics; architectural acoustics. Prereq: Phys 408; Math 527; permission. Lab. 4 cr.

757. FUNDAMENTALS OF COMMUNICATION SYSTEMS
Discussions of deterministic signals, Fourier spectra, random signals and noise, baseband communication, analog and digital modulation schemes, and system signal to noise ratio. Prereq: E E 646; permission. Lab. 4 cr.

758. COMMUNICATION SYSTEMS
Design of high-frequency communication systems. RF amplification, modulators for AM and FM systems, receiving techniques, antennas, free-space propagation, propagation characteristics of the ionosphere. Prereq: E E 603; E E 757 or equivalent; permission. Lab. 4 cr.

760. INTRODUCTION TO FIBER OPTICS
Basic physical and geometric optics; solution of Maxwell's equations for slab waveguides and cylindrical waveguides, of both step index and graded index profiles; modes of propagation and cutoff; polarization effects; group and phase velocity; ray analysis; losses; fabrication; sources; detectors; couplers; splicing; cabling; applications; system design. Prereq: Phys 703 or E E 603; permission. Lab. 4 cr.

762. ILLUMINATION
Radiation; color and spectra; physics of light production; sources of ultraviolet, visible, and infrared energy; lamp circuitry; control of light; lighting design, daylighting, light and energy applications of light in business, industry, school, home, and outdoors. Open to juniors and seniors in engineering and physics. Prereq: permission. Lab. 4 cr.

775. APPLICATIONS OF INTEGRATED CIRCUITS
Design and construction of linear and nonlinear electronic circuits using existing integrated circuits. Limitations and use of operational amplifiers. Laboratory course in practical applications of nondigital integrated circuit devices. Prereq: E E 652; permission. Lab. 4 cr.

781. PHYSICAL INSTRUMENTATION
Analysis and design of instrumentation systems. Sensors, circuits, and devices for measurement and control. Elements of probability and statistics as applied to instrument design and data analysis. Transmission, display, storage, and processing of information. The design, implementation, testing, and evaluation of a relevant instrument system is an integral part of the course. Prereq: senior standing in E E or permission. 4 cr.

782. CONTROL SYSTEMS
Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. Prereq: permission. Lab. (Also offered as M E 782.) 4 cr.

783. BIOMEDICAL ENGINEERING
Engineering applied to cardiovascular, renal, gastrointestinal, sensory, reproductive, and other organ systems. Design and utilization of diagnostic monitoring; and prosthetic techniques and devices. Prereq: permission. Lab. 4 cr.

784. BIOMEDICAL INSTRUMENTATION
Principles of physiological and biological instrumentation design including transducers, signal conditioning, recording equipment, and patient safety. Laboratory includes the design and use of instrumentation for monitoring of electrocardiogram, electromyogram, electroencephalogram, pulse, and temperature. Current research topics, such as biotelemetry, ultrasonic diagnosis, and computer applications. Prereq: permission. Lab. 4 cr.

785. UNDERWATER ACOUSTICS
Vibrations, propagation, reflection, scattering, reverberation, attenuation, sonar equations, ray and mode theory, radiation of sound, transducers, and small- and large-signal considerations. Prereq: permission. 4 cr.

786. INTRODUCTION TO RADIO ASTRONOMY
Electromagnetic radiation, propagation. Positional astronomy and the radio sky, discrete radio sources, source-structure distribution, the sun as a radio source, flare and burst activity, planetary emissions, quasars, pulsars, techniques of observation and data reduction, radiometry, polarimeters, correlation interferometers, aperture synthesis. Prereq: senior or graduate status in engineering and physical sciences; permission. 4 cr.

787. HUMAN PHYSIOLOGICAL CONTROL SYSTEMS
Analysis of human physiological control systems and regulators through the use of mathematical models. Identification and linearization of systems component. Membrane biophysics. System interactions, stability, noise, and the relationship of system malfunction to disease. Prereq: permission. 4 cr.

796. SPECIAL TOPICS IN ELECTRICAL ENGINEERING
New or specialized courses and/or independent study. Prereq: permission. 2 or 4 cr.

Engineering Technology (ET)

(For program description, see page 63.)

PROGRAM CHAIRPERSON: T. A. Parssinen
ASSOCIATE PROFESSOR: David A. Forest
ASSISTANT PROFESSORS: Ralph W. Draper, T. A. Parssinen
INSTRUCTOR: Robert E. Jessup
LECTURER: Stephen M. Dadoly

Permission of instructor is a prerequisite to all engineering technology courses.

633. BUSINESS ORGANIZATION AND LAW
Corporations; proprietorships; product liability; contracts; O.S.H.A.; commercial paper; conditions of employment; I.R.S.; bankruptcy; U.C.C. 4 cr.

634. ECONOMICS OF BUSINESS ACTIVITIES
Elementary financial accounting; compound interest and time value of money; sources of capital; cost estimating; depreciation; risk and insurance; personal finance. Prereq: differential and integral calculus. 4 cr.

637. HEAT AND FLUID POWER I
Work and heat, first and second laws of thermodynamics, chemical reactions, heat engines and refrigerators; applied to various cycles (i.e., power plants, turbines, jet engines, etc.). Field trips. Prereq: differential and integral calculus; physics. Lab. 4 cr.

638. HEAT AND FLUID POWER II
A continuation of 637 for MET students only. Further applications of thermodynamics. Additional topics will include heat transfer and fluid dynamics. Prereq: ET 637 or equivalent. Lab. 4 cr.

641. PRODUCTION SYSTEMS
Production standards—sources, uses; manufacturing capacity—design, analysis; manufacturing inventories and their control; production scheduling; production control. Prereq: differential and integral calculus. 4 cr.

644. MECHANICAL ENGINEERING TECHNOLOGY CONCEPTS IN DESIGN AND ANALYSIS
Kinematics, kinetics, work and energy, and vibrations; application of these concepts to problems in machine design. Prereq: strength of materials and dynamics. 4 cr.

645. INSTRUMENTATION
Statistics of experimentation; quantity standards and measurement; design of experiments; use of laboratory gear including dynamometer and viscosimeter; field trips. Prereq: differential and integral calculus; ET 644 or equivalent. Lab. 4 cr.

651. MECHANICAL ENGINEERING TECHNOLOGY PROJECT
Group project; students required to find solutions to actual technological problems in design, fabrication, and testing as posed by industry. Student team defines the problem, prepares a budget, and works with the client company to research, design, build, and test the software and/or hardware needed. Prereq: senior standing. A year-long course: 4 cr. each semester, 8 cr. total; an "IA" grade (continuous course) given at the end of first semester. Withdrawal from course results in loss of credit.

671. DIGITAL SYSTEMS
A digital systems design and applications course using TTL and CMOS MSI and LSI devices. Topics include: logic design of memory systems, interfacing (serial and parallel), and an introduction to microcomputers. A digital design project is required. Prereq: introductory digital design. Lab. 4 cr.

674. CONTROL SYSTEMS AND COMPONENTS
Feedback, principles; stability, Nyquist criteria; performance charts; introduction to equalizer design; control system components. Analog computer simulations. Prereq: differential and integral calculus. Lab. 4 cr.

675. ELECTRICAL TECHNOLOGY
Electrical circuits—DC and AC network analysis; transformers; physical principles of electronic devices; power supplies; transistor amplifiers—frequency response; introduction to operational amplifiers and digital electronics; transducers and instrumentation systems. Prereq: differential and integral calculus. Lab. 4 cr.

677. ANALOG SYSTEMS
Op Amp specifications, instrumentation and bridge amplifiers, advanced Op Amp circuits and linear ICs. Interfacing techniques, and A/D and D/A converts. Lab applications. Prereq: intro analog design. Lab. 4 cr.

680. COMMUNICATIONS AND FIELDS
Modulation and demodulation; noise, filter design, active filters and phase-lock loops; electric and magnetic fields; transmission lines; waveguide principles and components; antennas and radiation. Prereq: differential and integral calculus. Lab. 4 cr.

690. MICROCOMPUTER TECHNOLOGY
Microprocessors; their operation, programming, interfacing, and various uses. The 8085A is used as an operational model for hardware and software applications. SDK-85 microcomputer development systems are used for lab. Microcomputer applications, with emphasis on lab work. Prereq: ET 671. Lab. 4 cr.

691. ELECTRICAL ENGINEERING TECHNOLOGY PROJECT
Group project; students are required to find solutions to actual technological problems in design, fabrication, and testing, as posed by industry. Student team defines the problem, prepares a budget, and works with the client company to research, design, build, and test the software and/or hardware needed. Prereq: senior standing. A year-long course: 4 cr. each semester, 8 cr. total, an "IA" grade (continuous course) given at end of first semester. Withdrawal from course results in loss of credit.

695. INDEPENDENT STUDY
A) Topics in Engineering Technology Mathematics; B) Topics in Mechanical Engineering Technology; C) Topics in Electrical Engineering Technology. 1–4 cr.

English (Engl)

(For program description, see page 29.)

CHAIRPERSON: Carl Dawson
PROFESSORS: Thomas A. Carnicelli, Carl Dawson, Michael V. DePorte, Karl C. Diller, Robert Hapgood, Jean E. Kennard, Gary H. Lindberg, Terence P. Logan, Edmund G. Miller, Donald M. Murray, Philip L. Nicoloff, John C. Richardson, Charles D. Simic, Mark R. Smith, Thomas A. Williams, Jr., John A. Yount
ASSOCIATE PROFESSORS: Janet Aikins, Mary Morris Clark, Lester A. Fisher, Melody G. Graulich, Elizabeth H. Hageman, Mekeel McBride, Andrew H. Merton, Thomas R. Newkirk, Hugh M. Potter III, Susan Schibanoff, Patrocinio P. Schweikart, David H. Watters
ASSISTANT PROFESSORS: Robert J. Connors, Jane T. Harrigan, Susan Hertz, Rochelle Lieber, Sarah Way Sherman, David V. Siddall

See departmental brochure for detailed descriptions of course offerings.
English 401 is a prerequisite for all English courses but 400.

400. ENGLISH AS A SECOND LANGUAGE
A course to improve the competence of foreign students in listening comprehension, speaking, reading, and writing. Recommended as preparation for Engl 401. Prereq: student should meet with and have the permission of the instructor. 4 cr.

401. FRESHMAN ENGLISH
Training to write more skillfully and to read with more appreciation and discernment. Frequent individual conferences for every student. 4 cr.

402. FRESHMAN SEMINARS: APPROACHES TO LITERATURE
Intensive study of a specific topic, theme, genre, major figure, or period of English or American literature. No credit toward the English major. For details, see the course descriptions available in the department office and from freshman advisers. 4 cr. (Not offered every year.)

501. INTRODUCTION TO PROSE WRITING
Nonfiction writing; weekly papers and frequent conferences. May be repeated for credit with the approval of department chairperson. 4 cr.

505. INTRODUCTION TO LINGUISTICS
An overview of the study of language: animal communication vs. human language, universal properties of human language, Chomsky's innateness hypothesis, language acquisition in children, dialects and language variation, language change. Includes an introduction to modern grammar (phonology, syntax, and semantics) and to scientific linguistic methodology. (Also offered as Ling 505.) 4 cr.

512. INTRODUCTION TO AMERICAN LITERATURE
Works of major American writers from Irving to Faulkner, with emphasis on how to adapt and present the material to high school English classes. Open only to English teaching majors. 4 cr. (Not offered every year.)

513, 514. INTRODUCTION TO ENGLISH LITERATURE
Selected classic works in poetry and prose considered in chronological order and historical context. Attention to the works and to the ideas and tastes of their periods. 513: Beowulf through 18th century. 514: 1800 to the present. 4 cr.

515, 516. A SURVEY OF AMERICAN LITERATURE
515: From the beginning of American literature to the Civil War. 516: from the Civil War to the present. 4 cr.

518. THE BIBLE AS LITERATURE
Literature of the Old and New Testaments and the Apocrypha, primarily in the King James version. 4 cr.

519. INTRODUCTION TO CRITICAL ANALYSIS
Critical analysis of fiction, poetry, and drama. Frequent short papers. Required of all English majors; should be taken early in their programs. 4 cr.

520. LITERATURE AND THE HISTORY OF IDEAS
An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Barring duplication of subject, may be repeated for credit. 4 cr.

521. THE NATURE WRITERS
Fiction, poetry, and nonfiction books on the natural environment. Such books as Thoreau's *Walden* or *Maine Woods*, Leopold's *Sand County Almanac*, Beston's *Outermost House*, Dillard's *Pilgrim at Tinker Creek*, books by naturalists who observe nature vividly and knowingly and who write out of their concern for the environment. 4 cr.

522. AMERICAN LITERARY FOLKLORE
Folktales, songs, proverbs, beliefs, superstitions, and their use by such American authors as Irving, Hawthorne, Longfellow, Melville, Thoreau, Twain, Frost, and Faulkner; some emphasis on oral folk culture of New Hampshire. 4 cr.

523. MADNESS IN LITERATURE
How various writers depict insanity, and how they approach the problem of determining what attitudes and what behavior are truly sane. Emphasis on 19th- and 20th-century works, but works from earlier periods also considered. Euripides's The *Bacchae*, Shakespeare's *King Lear*, Cervantes's *Don Quixote*, Hoffman's *The Golden Pot*, Dostoevsky's *Notes from the Underground*, Robbe-Grillet's *The Voyeur*, Nabokov's *Pale Fire*, and other texts. 4 cr.

525. POPULAR CULTURE IN AMERICA
Cultural expression in popular media. Verbal arts (best sellers, magazines, newspapers, speeches); some attention to television, film, comics, popular music. The multidisciplinary approach deals with historical context, cultural institutions, and distinctions between "popular arts" and "great literature." Recurrent images, situations, and themes will be investigated to see what values are celebrated and fears revealed. 4 cr.

533. INTRODUCTION TO FILM
Introduction to the art, history, technology, and theory of the narrative motion picture from the silent period to the present. Examination of films by such filmmakers as Griffith, Keaton, Eisenstein, Renoir, Welles, Hitchcock, Bergman, Kurosawa. (Also offered as ThCo 533; students not majoring or minoring in communication or in theater must register for Engl 533.) 4 cr.

581. INTRODUCTION TO THIRD WORLD LITERATURE
A consideration of some of the literature that has come out of the Third World since the end of colonialism. Treated will be such writers as Rushdie, Cesaire, Walcott, Achebe, Naipaul, Narayan, and Marquez. 4 cr.

585. INTRODUCTION TO WOMEN IN LITERATURE
Survey of images of women in literature. Content and approach vary depending on instructor. 4 cr.

586. INTRODUCTION TO WOMEN WRITERS
Survey of women writers. Content and approach vary depending on instructor. 4 cr.

595. LITERARY TOPICS
Various faculty members investigate topics of special interest at a level appropriate for nonmajors. See department for details of current offerings. 1–4 cr.

609. ETHNICITY IN AMERICA: THE BLACK EXPERIENCE IN THE TWENTIETH CENTURY
Team-taught course investigating music, literature, and social history of Black America in the period of the Harlem Renaissance, in the Great Depression, World War II, and in the 1960s. Special attention to the theme of accommodation with and rejection of dominant white culture. (Also offered as Huma 609 and Musi 609.) 4 cr.

610. AMERICAN STUDIES: NEW ENGLAND CULTURE IN CHANGING TIMES
A team of three instructors from history, literature, and art investigate major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as Arts 610, Hist 610, and Huma 610.) Not for art studio major credit. 4 cr.

616. STUDIES IN FILM
Advanced, focused study of the cinema. Topics vary from year to year and with instructor. The focus may range from general consideration of film theory, film criticism, and film history, to specific analyses of selected genres, directors, and periods. (Also offered as ThCo 616; students majoring or minoring in communication or in theater must register for ThCo 616.) Prereq: Engl/ThCo 533 or permission. 4 cr.

619. CRITICAL APPROACHES TO LITERATURE
Selected methods of literary criticism applied to fiction, poetry, and/or drama with critical approaches varying from year to year. A follow-up of 519, course provides a second semester of training in critical reading and writing, examining such major modern strategies as formalist, biographical, archetypal, psychological, sociological, historical, feminist, and structuralist criticism. Prereq: Engl 519 or equivalent. 4 cr.

621, 622. NEWSWRITING
Workshops to develop reporting and writing skills. Prereq: Engl 501 or equivalent; written permission. May be repeated for credit with the approval of the department chairperson. 4 cr.

625, 626. WRITING FICTION
A workshop in the fundamental techniques of fiction writing. Student work is criticized by fellow students; individual conferences with instructor. Prereq: Engl 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

627, 628. WRITING POETRY
A workshop in the fundamental techniques of poetry writing. Class discussion and criticism of poems written by students. Individual conferences with instructor. Prereq: Engl 501 or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

630. POETRY
Twentieth-century American and British poetry. Various poetic techniques and their demonstration. See course descriptions available in department office for further information. 4 cr. (Not offered each semester.)

631. THE DRAMA
Nature and types of drama illustrated by major English, American, and (translated) European plays. How to read a play. Live and filmed performances studied as available. 4 cr.

632. FICTION
Modern novels and/or short stories. The ways in which fiction communicates its meanings; the tools and methods at the fiction writer's disposal, primarily as they function in individual works. See course descriptions available in department office for further information. 4 cr. (Not offered each semester.)

650. STUDIES IN AMERICAN LITERATURE AND CULTURE
Special topics in American Studies, varying from year to year. 4 cr. (Not offered every year.)

651, 652. COMPARATIVE LITERATURE
Comparative studies of major authors representative of important periods of world literary achievement. 651: Homer to Dante; common themes and the development of the epic tradition in early Western literature. 652: Renaissance to modern. Topics and approaches vary from semester to semester. 4 cr.

655. CHAUCER
A study of Chaucer's earlier works in the context of their continental sources and analogues. All readings in translation. 4 cr.

657. SHAKESPEARE
Ten major plays representative of the main periods of Shakespeare's career and the main types of drama which he wrote (tragedy, comedy, history). Live and filmed performances included as available. Restricted to undergraduates and designed for both English majors and students majoring in other fields. 4 cr.

685. WOMEN'S LITERARY TRADITIONS
Intensive study of theme, topics, and techniques in women's literature. Topics vary from year to year. 4 cr.

690. INTRODUCTION TO BLACK LITERATURE IN AMERICA
Selected prose, fiction, drama, and poetry. Individual works and historical-cultural background. Course will vary from year to year. 4 cr.

695, 696. SENIOR HONORS
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work; permission required. May be counted as two courses toward the ten that constitute a major in English. 4 cr. (Not offered every year.)

697, 698. ENGLISH MAJOR—SEMINAR
Intensive study of specialized topics that vary from year to year. Enrollment in each seminar is limited to 15 so that all students can take an active part in discussion and work closely with the instructor on their papers. Prereq: a grade of B or better in Engl 519 and permission. For details, see course description available in the department office. 4 cr.

701, 702. ADVANCED WRITING OF FICTION
Workshop discussion of advanced writing problems and readings of students' fiction. Individual conferences with instructor. Prereq: 625, 626, or equivalent; written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

703, 704. ADVANCED NONFICTION WRITING
A workshop course for students intending to write publishable magazine articles or nonfiction books. Equal stress on research and writing techniques. Prereq: Engl 621; 622 recommended. Written permission of instructor required. May be repeated for credit with the approval of the department chairperson. 4 cr.

705, 706. ADVANCED WRITING OF POETRY
Workshop discussion of advanced writing problems and submitted poems. Individual conferences with instructor. Prereq: Engl 627, 628, or equivalent. Written permission of instructor required for registration. May be repeated for credit with the approval of the department chairperson. 4 cr.

707. FORM AND THEORY OF FICTION
A writer's view of the forms, techniques, and theories of fiction. The novels, short stories, and works of criticism studied will vary, depending on the instructor. 4 cr.

708. FORM AND THEORY OF NONFICTION
A writer's view of contemporary nonfiction, emphasizing the choices the writer faces in the process of research and writing. 4 cr. (Not offered every year.)

709. FORM AND THEORY OF POETRY
A writer's view of the problems, traditions, and structures of poetry. 4 cr.

710. TEACHING WRITING
An introduction to various methods of teaching writing. Combines a review of theories, methods, and texts with direct observation of teaching practice. 2 or 4 cr.

713, 714. LITERARY CRITICISM
Major critics from Plato to the present; the chief critical approaches to literature. 4 cr. (Not offered every year.)

715. APPLIED LINGUISTICS: TEACHING ENGLISH AS A SECOND LANGUAGE
Methods of teaching and learning foreign languages; background work on theories of language acquisition; the methodology of teaching English as a second language. 4 cr.

716. PROBLEMS IN APPLIED LINGUISTICS
Variable topics course; problems such as language acquisition in children and adults and bilingualism. 4 cr. (Not offered every year.)

718. ENGLISH LINGUISTICS AND LITERATURE
An introduction to linguistics for students of literature. Includes a survey of the grammar of English (phonology, morphology, syntax, dialect variation, historical change) with applications to the analysis of the language of poetry and prose. 4 cr. (Not offered every year.)

720. NEWSPAPER INTERNSHIP
Students intending to pursue careers in journalism spend a semester working full or part time for a daily newspaper under close supervision of editors. Reporting is stressed, but students may do some editing as well. The number of internships is very limited. Prereq: Engl 621 or its equivalent; permission. 4–16 cr.

741. LITERATURE OF EARLY AMERICA
Prose and poetry of the periods of exploration, colonization, early nationalism, Puritanism, Enlightenment. Individual works and historical-cultural background. 4 cr. (Not offered every year.)

742. AMERICAN LITERATURE, 1815–1865
Fiction, nonfiction, and poetry in the period of romanticism, transcendentalism, nationalism. Individual works and cultural background. 4 cr. (Not offered every year.)

743. AMERICAN LITERATURE, 1865–1915
Fiction, nonfiction, and poetry in the period of realism, naturalism, industrialism, big money. Individual works and cultural background. 4 cr.

744. AMERICAN LITERATURE, 1915–1945
Fiction, poetry, and drama in the period of avant-garde and leftism, jazz age, and depression. Individual works and cultural background. 4 cr.

745. CONTEMPORARY AMERICAN LITERATURE
A gathering of forms, figures, and movements since 1945. Individual works and cultural background. 4 cr.

746. STUDIES IN AMERICAN DRAMA
Topics vary from year to year. Examples: 20th-century American drama; contemporary playwrights; theatricality in American life. 4 cr. (Not offered every year.)

747. STUDIES IN AMERICAN POETRY
Topics vary from year to year. Examples: poets of the open road; Pound and his followers; major American poets; contemporary American poetry. 4 cr. (Not offered every year.)

748. STUDIES IN AMERICAN FICTION
Topics vary from year to year. Examples: the romance in America; the short story; realism and naturalism; the city novel; fiction of the thirties. 4 cr.

749. MAJOR AMERICAN AUTHORS
Intensive study of two or three writers. Examples: Melville and Faulkner; Fuller, Emerson, and Thoreau; James and Wharton; Dickinson and Frost. 4 cr.

750. SPECIAL STUDIES IN AMERICAN LITERATURE
Topics vary from year to year. Examples: the Puritan heritage; ethnic literatures in America; landscape in American literature; five American lives; pragmatism; American humor; transcendentalism; women regionalists. 4 cr.

751. MEDIEVAL EPIC AND ROMANCE
The two major types of medieval narrative; comparative study of works from England, France, Germany, and Iceland, including *Beowulf, Song of Roland, Niebelungenlied,* Gottfried's *Tristan, Njal's Saga,* and Malory's *Morte d'Arthur.* All works read in modern English translations. 4 cr. (Not offered every year.)

752. HISTORY OF THE ENGLISH LANGUAGE
Evolution of English from the Anglo-Saxon period to the present day. Relations between linguistic change and literary style. 4 cr. (Not offered every year.)

753. OLD ENGLISH
Introduction to Old English language and literature through the readings of selected poetry and prose. 4 cr.

754. BEOWULF
A reading of the poem and an introduction to the scholarship. Prereq: Engl 753. 4 cr.

755, 756. CHAUCER
755: *Troilus and Criseyde,* in the context of medieval continental literature by Boccaccio and other influences. 756: *The Canterbury Tales* in its original language. 4 cr.

758. SHAKESPEARE
A few plays studied intensively. Live and filmed performances included as available. 4 cr.

759. MILTON
Milton and his age. Generous selection of Milton's prose and poetry, with secondary readings of his sources and contemporaries. 4 cr. (Not offered every year.)

763. CONTINENTAL BACKGROUNDS OF THE ENGLISH RENAISSANCE
Major philosophers, artists, and writers of the continental Renaissance (in translation): Petrarch, Ficino, Pico, Vives, Valla, Castiglione, Machiavelli, Luther, Calvin, Rabelais, Montaigne, Cervantes, Erasmus, and Thomas More, as representative of the early English Renaissance. 4 cr. (Not offered every year.)

764. PROSE AND POETRY OF THE ELIZABETHANS
Shakespeare and his contemporaries. Major works, including Spenser's *Fairie Queene,* Sidney's *Astrophil and Stella,* Shakespeare's *Sonnets,* Marlowe's *Dr. Faustus*: their literary and intellectual backgrounds. 4 cr. (Not offered every year.)

765. ENGLISH LITERATURE IN THE 17TH CENTURY
Major writers of the 17th century, including Donne, Jonson, Herbert, Bacon, and Hobbes. 4 cr. (Not offered every year.)

767, 768. LITERATURE OF THE RESTORATION AND 18TH CENTURY
Representative works; texts studied closely; the ways they reflect the central intellectual problems of their age. 767: Dryden, Rochester, Restoration plays, Bunyan, Defoe, Montesquieu, and Swift.

768: Pope, Fielding, Johnson, Boswell, Voltaire, Sterne, Rousseau, Beckford, Diderot, and Blake. 4 cr.

769, 770. THE ENGLISH ROMANTIC PERIOD
Major literary trends and authors, 1798 to 1832. Focus on poetry but attention also to prose works and critical theories. 769: Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey; 770: Byron, Shelley, Keats. 4 cr. (Not offered every year.)

771, 772. VICTORIAN PROSE AND POETRY
Major writers; social and cultural history. Typically included in 771: Carlyle, Ruskin, Newman, Tennyson, Browning, and others; in 772: Arnold, the Pre-Raphaelites, Swinburne, Hopkins, and others. 4 cr. (Not offered every year.)

773, 774. BRITISH LITERATURE OF THE 20TH CENTURY
Poets and novelists; the concept of modernity in literature. Offerings vary by year and by instructor, but normally include such figures as Joyce, Lawrence, Yeats, Woolf, Forster, and more contemporary writers such as Burgess, Fowles, Murdoch, and Golding. 4 cr.

775. IRISH LITERATURE
Survey from the beginnings to present; works in Irish (read in translation) such as *The Cattle Raid of Cooley*, medieval lyrics, and *Mad Sweeney*; and works in English from Swift to the present. Twentieth-century authors: Joyce, Yeats, Synge, O'Casey, Beckett, and Flann O'Brien. 4 cr. (Not offered every year.)

778. BRAIN AND LANGUAGE
An introduction to neurolinguistics, a study of how language is related to the structure of the brain. The biological foundations of linguistic universals and language acquisition. Examination of evidence from aphasia and from normal language use. 4 cr.

779. LINGUISTIC FIELD METHODS
A study of a non-Indo-European language by eliciting examples from an informant, rather than from written descriptions of the language. The purpose of the course is to learn how to figure out the grammar of a language from raw data. 4 cr. (Not offered every year.)

780. ENGLISH DRAMA TO 1640
Development of the drama through the Renaissance, emphasizing the Elizabethan and Jacobean dramatists. 4 cr.

781. ENGLISH DRAMA, 1660-1780
Representative plays, both serious and comic, by such writers as Wycherly, Congreve, Etherege, Goldsmith, Sheridan, Davenant, Dryden, Otway, Rowe, and Lillo. 4 cr.

782. MODERN DRAMA
Major English, American, and (translated) European plays of the modern period by such playwrights as Shaw, Ibsen, Chekhov, Strindberg, Pirandello, O'Neill, Brecht, Beckett, Williams, Miller, Pinter. Live and filmed performances studied as available. 4 cr. (Not offered every year.)

783. THE ENGLISH NOVEL OF THE 18TH CENTURY
The rise and development of the novel through study of selected major works by Defoe, Richardson, Fielding, Smollett, Sterne, and Austen. 4 cr.

784. THE ENGLISH NOVEL OF THE 19TH CENTURY
Representative novels from among Austen, Scott, Dickens, Thackeray, Emily Brontë, Charlotte Brontë, Trollope, George Eliot, Hardy, and Conrad. 4 cr.

785. MAJOR WOMEN WRITERS
Intensive study of one or more women writers. Selections vary from year to year. 4 cr.

790. SPECIAL TOPICS IN LINGUISTIC THEORY
An advanced course on a topic chosen by the instructor. Inquire at the English department office for a full course description each time the course is offered. Topics such as word formation, dialectology, linguistic theory and language acquisition, history of linguistics, language and culture, cross-disciplinary studies relating to linguistics. Also offered as Ling 790. Barring duplication of subject, may be repeated for credit. 4 cr.

791. ENGLISH GRAMMAR
A survey of the grammar of English (pronunciation, vocabulary, sentence structure, punctuation, dialect variation, historical change) with special attention to the distinction between descriptive and prescriptive grammar and to the problems students have with formal expository writing. 4 cr.

792. TEACHING SECONDARY SCHOOL ENGLISH
Methods of teaching language, composition, and literature in grades 7-12. Required of all students in the English teaching major. Open to others with permission. 4 cr.

793. PHONETICS AND PHONOLOGY
The sound system of English and other languages as viewed from the standpoint of modern linguistic theory, including the following topics: the acoustic and articulatory properties of speech sounds, the phonemic repertoires of particular languages, phonological derivations, and prosodic phenomena such as stress and intonation. Also offered as Ling 793. Prereq: a basic linguistics course or permission. 4 cr.

794. SYNTAX AND SEMANTIC THEORY
The relationship of grammar and meaning as viewed from the standpoint of modern linguistic theory. Emphasis on the syntax and semantics of English, with special attention to the construction of arguments for or against particular analyses. Also offered as Ling 794. Prereq: a basic linguistics course or permission. 4 cr.

795. INDEPENDENT STUDY
Open to highly qualified juniors and seniors. To be elected only with permission of the department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit up to a maximum of 16 credit. 1–16 cr.

797, 798. SPECIAL STUDIES IN LITERATURE
A) Old English Literature; B) Medieval Literature; C) 16th Century; D) 17th Century; E) 18th Century; F) English Romantic Period; G) Victorian Period; H) 20th Century; I) Drama; J) Novel; K) Poetry; L) Nonfiction; M) American Literature; N) A Literary Problem; O) Literature of the Renaissance. The precise topics and methods of each

section will vary. Barring duplication of subject, may be repeated for credit. For details, see the course descriptions available in the English department. 4 cr.

Entomology (Ento)

(For program description, see page 44.)

CHAIRPERSON: Paul C. Johnson
PROFESSOR: James S. Bowman
ASSOCIATE PROFESSORS: John F. Burger, G. Thomas Fisher, Paul C. Johnson, R. Marcel Reeves
ASSISTANT PROFESSOR: Donald S. Chandler
ADJUNCT ASSISTANT PROFESSOR: Siegfried E. Thewke

400. INSECTS AND SOCIETY
Insects and their relations to humans, their environment, and their activities. Not for major credit. 4 cr.

402. INTRODUCTORY ENTOMOLOGY
Insect structure and function, development, classification, ecology, behavior, and evolution for students in the biological sciences; importance of insects in terrestrial and aquatic ecosystems. Insect collection required. Special fee. Lab. 4 cr.

503. PRINCIPLES OF APPLIED ENTOMOLOGY
Nature of destructive and beneficial insects and the fundamentals of insect pest management in our modern society. Elective for sophomores, juniors, and seniors. 4 cr.

506. FOREST ENTOMOLOGY
Especially for forest resources majors. Structure, development, classification, and control of representative forest insects. Insect collection required. Special fee. Lab. 4 cr.

695. PROBLEMS IN ENTOMOLOGY
Problems and independent investigations in the various fields of basic and applied entomology. Prereq: Ento 402 and 503; permission. 2-4 cr.

704. MEDICAL ENTOMOLOGY
Survey of past and present trends in arthropod-borne diseases transmitted to human populations, emphasizing dynamics of arthropod-host-pathogen/parasite relationships, natural nidality of disease, and role of arthropods and other animals as reservoirs or vectors of disease and maintenance of zoonoses. Laboratory emphasizes survey of arthropod groups important as disease vectors or envenomizing humans. Elective for juniors and seniors. Lab. 4 cr.

705. SYSTEMATICS AND TAXONOMY OF INSECTS
The kinds and diversity of insects and their relationships, emphasizing methods of species and population analysis, concepts of classification and nomenclature, and application to identification. Prereq: Ento 402; Zool 412; /or permission. Lab. 4 cr.

706. SOIL ARTHROPODS
Biology and systematics of terrestrial arthropods, with emphasis on the springtails, sowbugs, myriapods, mites, spiders, and other arachnids. Prereq: permission. Lab. 4 cr. (Not offered every year.)

707. IMMATURE INSECTS
Identification of immature stages of insects, especially of holometabolus orders. Aquatic forms not included. Morphological features necessary for determination. Prereq: permission. 4 cr. (Not offered every year.)

709. AQUATIC INSECTS
Biology, ecology, and taxonomy of aquatic insects, including their role in succession and food webs of aquatic ecosystems, origin and evolution of adaptations to aquatic environments and relationship between habitat type and faunal diversity. Laboratory emphasizes qualitative and semi-quantitative sampling techniques, collection and identification of principal aquatic groups. Prereq: Ento 402 or Zool 412; permission. Lab. 4 cr. (Not offered every year.)

710. INSECT MORPHOLOGY
External and internal anatomy of insects, with the integration of body structure and function. Prereq: permission. Lab. 4 cr. (Not offered every year.)

720. AGRICULTURAL ENTOMOLOGY
For advanced students interested in agribusiness. Economic insect pests on forage, fruit, and vegetable crops. Life cycles; damage and current methods of control. Prereq: permission. Lab. 4 cr.

721. PRINCIPLES OF BIOLOGICAL CONTROL
Natural and applied aspects of biological control of insect and plant pests. Prereq: permission. 4 cr. (Not offered every year.)

722. CHEMICAL CONTROL OF INSECTS
For advanced students in applied entomology. Review of the chemical compounds for insect control. Modes of pesticide entry; toxicology. Basic understanding of chemistry is desired. Prereq: permission. Lab. 4 cr.

723. REGULATORY PEST CONTROL
For students preparing for careers dealing directly with or associated with the movement of agricultural commodities in internal and foreign trade. Legal documents; federal and state statutes. Prereq: basic entomology and plant pathology courses; permission. 2 or 4 cr. (Not offered every year.)

724. STRUCTURAL PEST CONTROL
For students wishing to study household and industrial entomology. Prereq: permission. Lab. 4 cr.

725. INSECT ECOLOGY
Role of insects in: coevolution of plant-herbivors and predator/parasite-prey systems, ecosystem energetics, population dynamics, niche theory, competition, coexistence, diversity, and stability. Prereq: permission. Not for graduate credit. 4 cr. (Not offered every year.)

726. INTEGRATED PEST MANAGEMENT
Integration of pest management techniques involving biological, cultural, and chemical control with principles of ecology into management approaches for pests. Prereq: permission. 4 cr.

Environmental Conservation

(See Forest Resources.)

Environmental Engineering

(See pages 54, 57, 59.)

Family and Consumer Studies (FCS)

(For program description, see page 45.)

CHAIRPERSON: Larry J. Hansen
ASSOCIATE PROFESSORS: Larry J. Hansen, Michael F. Kalinowski, Victor R. Messier, Elizabeth A. Snell
ASSISTANT PROFESSORS: Kristine M. Baber, Elizabeth Dolan, Charlene J. Langdale
INSTRUCTOR: Kenneth Jobst

455. INTRODUCTION TO CONSUMER STUDIES
Survey of consumer studies. Introduction to consumer decision making; consumer problems; consumer protection. 4 cr.

501. CONTEMPORARY ISSUES IN FAMILY AND CONSUMER STUDIES
Analysis of current issues and career opportunities; life and career planning. 4 cr. Cr/F. (Fall semester only.)

525. HUMAN DEVELOPMENT
Developmental information from conception through death; theoretical perspectives and research methods in human development; emphasis on student's communication and analytical skills. 4 cr.

553. PERSONAL AND FAMILY FINANCE
Applied financial management; allocation of income to maximize wealth. Topics include banking, investments, credit, insurance. 4 cr.

555. MANAGEMENT AND DECISION MAKING
Theories of management, information processing, and decision making in the allocation of resources. 4 cr.

556. HOUSING AND DESIGN
Housing examined in terms of design, physical, socio-psychological, and community needs. 4 cr. (Not offered every year.)

615. FIELD EXPERIENCE
Work with agency, institution, or organization concerned with the welfare of families and individuals. Students will plan with department adviser and apply for approval. Prereq: approval of departmental faculty. 1–6 cr.

623. DEVELOPMENTAL PERSPECTIVES ON INFANCY AND EARLY CHILDHOOD
Integrative view of the developing child from conception through childhood within the family context. Prereq: FCS 525. 4 cr. (Fall semester only.)

624. DEVELOPMENTAL PERSPECTIVES ON ADOLESCENCE AND EARLY ADULTHOOD
Developmental information from pubescence through early adulthood; the concept of identity and influences on identity formation. 4 cr. (Spring semester only.)

635. LEARNING IN CHILD DEVELOPMENT SETTINGS
Current theoretical approaches to communicating with children and influencing their behavior. Weekly four-hour laboratory experience working with preschool children is required at UNH Child-Family Center. Weekly three-hour seminar. Prereq: FCS 525; permission. 4 cr.

645. FAMILY RELATIONS
Theories and research relating to the family and its role in individual development. 4 cr.

653. CONSUMER PROBLEMS
Examination of contemporary problems confronting consumers. 4 cr.

654. CONSUMER PROTECTION
Types of protection available to consumer. Agencies that have consumer mandates, the laws pertaining to them, their functioning, and their effectiveness. 4 cr.

664. CONSUMER BEHAVIOR
Survey of consumer behavior theory and research from economic, psychological, and sociological perspectives. Examination of the effects of business, marketing, and advertising strategies on purchase decisions. 4 cr.

695. INDEPENDENT STUDY
Scholarly project in the area of child, family, and consumer studies. Regular conferences with supervising faculty required. Prereq: approval of departmental faculty. 1–6 cr.

707. PRACTICUM
Supervised in-depth experience in teaching, research, or advocacy in a professional setting to increase the student's understanding of children, families, or consumer issues. A) Child; B) Family; C) Consumer Studies. Prereq: FCS major; permission. 1–6 cr. Cr/F.

708. CHILD DEVELOPMENT LABORATORY INTERNSHIP
Supervised positions within the UNH Child and Family Center: a) videotape assistant; b) assessment assistant; c) toddler program assistant; d) preschool program assistant. Can be repeated up to a total of 9 credits. Prereq: FCS 635; permission. 1–6 cr. Cr/F.

733. SUPERVISING PROGRAMS FOR YOUNG CHILDREN
Philosophical bases and theoretical rationales of various programs for young children; program alternatives and resources; issues in administration including supervision, finances, and regulations. Prereq: permission. 4 cr. (Fall semester only.)

734. CURRICULUM FOR YOUNG CHILDREN
Designing and implementing developmentally appropriate activities for young children; assessing the effectiveness of activities; evaluating materials and equipment. Prereq: FCS 525; 623; 635; 733; permission. 4 cr. (Spring semester only.)

743. PARENTS, CHILDREN, AND PROFESSIONALS
Exploration of professional roles related to child and family advocacy. Consideration of philosophical, ethical, and pragmatic issues in the helping

professions; evaluation and design of advocacy programs. Prereq: permission. 4 cr. (Fall semester only.)

744. APPLIED FAMILY SYSTEMS
Family systems theory; the dynamics of family systems and system change; educational strategies for working with families. Prereq: permission. 4 cr. (Spring semester only.)

753. FAMILY ECONOMICS
The impact of economic change on families, family income, and resource allocation. Prereq: one course in economics or permission. 4 cr.

754. CONSUMERS IN SOCIETY
Problems and issues facing selected groups of consumers: the elderly, the poor, children and adolescents, women, and others. Prereq: permission. 4 cr.

763. CONSUMER DECISION MAKING
Examination of individual and group consumer decision-making strategies and styles, including information acquisition, information processing, negotiation, and power. Prereq: permission. 4 cr.

782. FAMILY INTERNSHIP
Supervised experience in working with families. Students will spend a minimum of 20 hours a week in a selected program that offers educational services to families. Students must apply during the spring semester of their junior year. Prereq: FCS major; FCS 525; 623; 635; 645; 743; permission. Coreq: FCS 792. 8 cr. Cr/F. (Spring semester only.)

788. STUDENT TEACHING OF YOUNG CHILDREN
Supervised teaching experience. Students spend a minimum of 20 hours per week in a selected program for young children working with a cooperating teacher. Students must apply during the spring semester of their junior year. Prereq: FCS major; FCS 525; 623; 635; 645; 733; 734; 743; Educ 500 and 706; PhEd 675; ThCo 520; Math 621; permission. Coreq: FCS 798. 8 cr. Cr/F. (Spring semester only.)

791. METHODS OF TEACHING
Curriculum materials, methods, and resources in teaching family and consumer studies. Prereq: permission. 4 cr.

792. SEMINAR FOR FAMILY INTERNS
This weekly seminar focuses on issues of concern to family internship students; provides advanced training in educational strategies for working with families; and develops students' professional skills. Prereq: admission to family internship program. Coreq: FCS 782. 4 cr. (Spring semester only.)

797. SPECIAL TOPICS
Highly focused examination of a particular theoretical, methodological, or policy issue. Prereq: permission. 4 cr.

798. SEMINAR FOR STUDENT TEACHERS
This weekly seminar supplements the student teaching experience and serves both as a forum for discussion of common concerns to student teachers and as a final, professional seminar. Prereq: admission to student teaching. Coreq: FCS 788. 4 cr. (Spring semester only.)

Forest Resources

CHAIRMAN: Harold W. Hocker, Jr.
PROFESSORS: James P. Barrett, Gordon L. Byers, John E. Carroll, Nicolas Engalichev, Robert D. Harter, John L. Hill, Harold W. Hocker, Jr., William W. Mautz, David P. Olson.
ADJUNCT PROFESSOR: Robert S. Pierce
ASSOCIATE PROFESSORS: Robert T. Eckert, Nobel K. Peterson, R. Marcel Reeves, Richard R. Weyrick
ADJUNCT ASSOCIATE PROFESSORS: C. Anthony Federer, James W. Hornbeck, William B. Leak, Sidney A. L. Pilgrim, Lawrence O. Safford
ASSISTANT PROFESSORS: William A. Befort, Theodore E. Howard, John A. Litvaitis, Richard G. Parker, C. Tattersall Smith
FACULTY IN RESIDENCE, ASSISTANT PROFESSOR: David M. O'Malley
ADJUNCT ASSISTANT PROFESSORS: Maurice E. Demeritt, Jr., Peter W. Garrett, Mary K. Reynolds

Environmental Conservation (E C)

(For program description, see page 45.)

503. WETLANDS RESOURCES
Examination of coastal and adjacent freshwater and estuarine wetlands from historical, destruction, and preservation perspectives. Field trips and laboratory sessions emphasize succession and investigation of dominant plant, insect, and vertebrate associations. Daily and evening lectures, labs, and field work. Prereq: one full year of college-level biology. 1 cr. (Offered summers at the Shoals Marine Laboratory.)

595, 596. PROBLEMS IN NATURAL AND ENVIRONMENTAL RESOURCES
Students pursue field, laboratory, or library problems in natural and environmental resources that are not covered by other courses. A faculty consultant and a study topic must be chosen prior to registration for the course. In consultation with the faculty adviser, students are expected to select the problem area, create a bibliography for reflection, and find channels to actively pursue the topic. A professionally written paper is expected at termination of the study. May be repeated once for credit. Prereq: permission. 2–4 cr.

609, 610. SEMINAR
Seminars arranged according to student needs. A) Forestry; B) Hydrology; C) Soils; D) Wildlife; E) Environmental Conservation; F) Coastal Zone Management. Optional lab/field trips. Prereq: permission. Transportation fee. 1–3 cr.

611. COASTAL RESOURCE MANAGEMENT
Systematic and regional analysis of the environmental problems caused by human use and misuse of the coastal zone (estuaries, wetlands, salt marsh, beaches); alteration, destruction, and pollution of these environments. Some emphasis on coast and shoreline of the Northeast with fieldwork. Transportation fee. 4 cr.

635. CONTEMPORARY CONSERVATION ISSUES
How human technology causes biological and social conflicts when applied to the ecosystem; multiple demands of game, timber, water, minerals, and soil ecosystems vs. economic growth. Not open to freshmen. 4 cr.

637. PRACTICUM IN ENVIRONMENTAL CONSERVATION
Independent participation in an environmental conservation activity in the area of the student's specialization. Individual or group project may be developed under the supervision of any faculty member within or outside FoRs or with supervisors in public and private agencies, upon approval of the course instructor. Research projects not acceptable. Prereq: senior standing in the environmental conservation program. Lab. 4 cr. Cr/F. (Fall semesters only.)

702. NATURAL RESOURCES POLICY
Contemporary issues in the management and allocation of natural resources; impact of humans on agricultural and forest lands, water, wildlife, fisheries, and minerals; historical perspective of current resource policies. (Also offered as REco 702.) 4 cr.

718. LAW OF NATURAL RESOURCES AND ENVIRONMENT
For resource managers: the legal system pertaining to resource management, protection of the environment, and possibilities for future action. Prereq: E C 635 or REco 606 or equivalent. (Also offered as REco 718.) 3 cr.

Forest Resources (FoRs)

(For program description, see page 46.)

400. ORIENTATION IN FORESTRY
Presentations, class discussions, and projects directed toward providing understanding of studies in forestry and preparation for careers in forestry. Required of all new students in the forestry program. Transportation fee. 0 cr. Cr/F.

423. DENDROLOGY
North American forest trees: taxonomy, silvical characteristics, community relationships; major forest regions. Restricted to forest resources and wildlife management majors; others by permission of instructor. Must be taken concurrently with FoRs 425. 2 cr.

425. FIELD IDENTIFICATION OF TREES AND SHRUBS
Identification and nomenclature of important North American trees; emphasis on trees and associated woody species of the Northeast. Forest resources and wildlife management majors must take concurrently with FoRs 423. Transportation fee. Lab. 2 cr.

426. WOOD SCIENCE AND TECHNOLOGY
Wood microstructure and identification: physical, chemical, and mechanical properties; characteristics of wood including those produced by growth and form (i.e., knots, cross-grain) and those produced by degradation (i.e., stain, decay); log and lumber processing and quality evaluation; preparation of wood for use, including drying, gluing, and protection against degrade. Transportation fee. Lab. 4 cr.

500. SUMMER WORK EXPERIENCE
Work in forestry or closely related field; must be performed under professional supervision or approved by forest resources faculty. Students are responsible for arranging their own experience. (Forest resources majors only.) May be repeated. 0 cr. Cr/F.

502. THE ENDANGERED FORESTS
Discussion of the two major international problems in forestry: dying of forests due to air pollution in developed countries; and loss of forests due to clearing and heavy cutting in tropical countries. The value of forests and their importance to people. Guest speakers and field trip. 2–4 cr.

504. FRESHWATER RESOURCES
Major determinants of freshwater resources including: hydrologic cycle and water balance; precipitation; stream-flow measurement; pollution; water supply and sewage treatment; water resource development. Lab. 4 cr.

527. SILVICS
Ecological base of silviculture; evolution and genetics of forest trees; classification of forest communities; forest environment; forest biota. Prereq: Bot 412; FoRs 425 or Bot 566; Soil 501 taken concurrently. Transportation fee. Lab. 4 cr.

542. FORESTLAND MEASUREMENT AND MAPPING
Elementary measuring equipment and techniques; preparation of maps; public land survey; courthouse deed search. Two-week field session following spring semester. (Forest resources and wildlife majors only.) Transportation fee. 2 cr.

544. FOREST MENSURATION
Basic sampling techniques used in natural resource inventories including field applications. Estimates of forest growth and yield. Prereq: calculus, statistics, computer programming, and elementary land surveying. Transportation fee. Lab. 4 cr.

581. METHODS IN LAND SURVEYING
Principles and field methods of land surveying for the natural resource manager; measurement of distance, direction, and elevation; instrumentation and computation; legal aspects of land description and boundary. Prereq: FoRs 542 or permission. Lab. 4 cr. (Not offered every year.)

603. HYDROLOGY AND WATER MANAGEMENT
Hydrology and water management engineering principles and the control of water; precipitation and stream-flow measurement, hydrograph development, estimating runoff from a watershed, and the design of structures to control this runoff. Instrumentation and problem analysis. Transportation fee. Lab. 4 cr.

629. SILVICULTURE
Application of ecological knowledge to the control, establishment, composition, and growth of forest stands for economic purposes. Prereq: FoRs 423 and 527. Transportation fee. Lab. 3 cr.

630. FOREST HARVESTING AND SILVICULTURE
Harvesting and silvicultural practices. Prereq: FoRs 629 or permission. Limited enrollment. 2 cr. Cr/F.

643. FOREST ECONOMICS
Supply and demand for forest products and services; forestry and the general economy; economics of the firm; microeconomics; taxation. Prereq: a course in principles of economics. 4 cr.

652. FOREST RESOURCES MEASUREMENTS AND MAPPING
Aerial photo type mapping and forest resources inventory: type identification and delineation, map construction, cruise design, and forest resources inventory. Two-week field session following spring semester. (Forest resources majors, others by permission.) Prereq: FoRs 527 and 644. Transportation fee. 2 cr.

660. FOREST FIRE PROTECTION
Forest fire prevention, behavior, and effective control; weather phenomena; other aspects of forest damage; fire effects and use. Prereq: FoRs 527 or 629; Soil 501. Transportation fee. Lab. 2 cr.

695. INVESTIGATIONS IN FORESTRY
A) Forest Ecology; B) Remote Sensing; C) Wood Products; D) Mensuration; E) Forest Economics; F) Forest Management; G) Operations; H) Recreation; I) Policy; J) Forest Genetics; K) Watershed Management. Prereq: permission. 1–4 cr.

711. STATISTICAL METHODS II
Intermediate course; basic concepts of sampling, linear models and analyses for one-way and multiway classification, factorial arrangement of treatments, multiple regression, and covariance. Computer programs used in analyzing data. Examples from environmental sciences. Prereq: REco 528 or equivalent. (Also offered as PlSc 711.) 4 cr.

712. SAMPLING TECHNIQUES
Techniques of sampling finite populations in environmental sciences; choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Prereq: REco 528 or equivalent. 2–4 cr. (Not offered every year.)

713. QUANTITATIVE ECOLOGY
Applied quantitative techniques: basic concepts in probability and statistics applied to ecological systems; population dynamics; spatial patterns; species abundance and diversity; classification and ordination; production; and energy and nutrient flow. Additional credit for in-depth mathematical analysis of a particular topic. Prereq: introductory courses in calculus, statistics, and ecology. 3 or 4 cr. (Not offered every year.)

720. FOREST GENETICS
Genetics of forest tree improvement; variation in natural populations, breeding methods, physiological characters, quantitative data analysis. Prereq: PlSc 604 (Zool 604); FoRs 629; statistics; /or permission. Transportation fee. Lab. 3 cr. (Not offered every year.)

722. ADVANCED SILVICULTURE
Intensive silviculture of forest stands. Regeneration (e.g., alternative regeneration methods and site preparation); stand management (e.g., thinning schedules and fertilization). Prereq: FoRs 629 or equivalent; permission. Transportation fee. 3 cr. (Not offered every year.)

734. FOREST PROTECTION SEMINAR
Discussion and special problems based on principles and techniques of forest protection. Prereq: permission. 3 cr. (Not offered every year.)

745. FOREST MANAGEMENT
Forest land ownership; management objectives; forest inventory regulation and economic analysis; forest administration; professional responsibilities and opportunities. Prereq: completion of junior year in forestry curriculum. Transportation fee. Lab. 4 cr.

753. QUANTITATIVE METHODS FOR FOREST RESOURCE MANAGEMENT
Quantitative tools for decision making in forest resource management activities; capital investment analysis, break-even and marginal analysis, linear and dynamic programming, simulation, decision analysis. Prereq: calculus; forest economics; statistics; mensuration. Lab. 4 cr.

754. WOOD PRODUCTS MANUFACTURE AND MARKETING
Wood products from harvesting and procurement of raw material to finished product processes, management decisions, marketing, and promotion problems. The case study approach is backed up by weekly all-day field trips to wood products manufacturing plants in the region. Prereq: FoRs 426; or permission. Transportation fee. Lab. 4 cr.

755. REGIONAL SILVICULTURE AND FOREST MANAGEMENT
Extended field trip to another forest region. Prereq: senior standing; FoRs 745; /or permission. Limited enrollment. 2 cr. Cr/F.

757. BASICS OF REMOTE SENSING
Fundamentals for application of photographic and nonphotographic sensors to information gathering in natural resource fields; emphasis is on the interpretation of aerial photographs. Applications to forestry, wildlife, land-use planning, earth sciences, soils, hydrology, and engineering. Transportation fee. Lab. 2 cr.

758. AERIAL TERRAIN ANALYSIS
Visual interpretation of aerial and satellite imagery for study of landforms, geology, hydrology, vegetation, and cultural patterns; applications in U.S. geography. Prereq: FoRs 757 or equivalent; binocular vision an advantage. Transportation fee. Lab. 2 cr.

759. DIGITAL GEOIMAGE ANALYSIS
Computer enhancement and classification of remotely sensed images; integration of remotely sensed data into computer-based geographic information systems. Prereq: FoRs 757 or equivalent. Lab. 4 cr.

764. FOREST INDUSTRY ECONOMICS
Business methods and economics in the forest industry; planning for minimum cost operations and profitable use of capital in a forest enterprise. Individual projects. Prereq: senior standing; permission. 4 cr. (Not offered every year).

798. FOREST RESOURCES MANAGEMENT SEMINAR
The integration of demands from human population changes and needs on forest productivity through planning. The recognition of environmental quality and ecological concepts as planning cri-

teria. Class discussions and group planning. Prereq: FoRs 745. Transportation fee. Lab. 4 cr.

Soil Science (Soil)

(For program description, see page 49.)

501. SOILS AND THE ENVIRONMENT
Physical, chemical, and biological aspects of soils in the environment. Labs coordinate with lectures. Transportation fee. Lab. 4 cr.

502. SOIL-PLANT RELATIONSHIPS
Soils evaluated in terms of requirements for optimum growth of plants. Emphasis on nutrient availability. Soils and world food problems. Transportation fee. Lab. 4 cr.

601. SOIL MORPHOLOGY
Study and description of New Hampshire soils in the field; standards of National Cooperative Soil Survey used; strong orientation to field work (10 outdoor labs) and the application of soil properties to forestry, plant science, soil science, community planning, and waste disposal on land. Prereq: Soil 501 or permission. Transportation fee. Lab. 3 cr.

602. CHEMICAL ANALYSIS OF SOIL
Methods of soil chemical analysis. Prereq: quantitative analysis; permission. Lab. 2 cr.

605. FOREST SOILS
Forest soil development; chemical, physical, and biological properties of forest soils; tree roots and nutrient uptake; soil-site evaluation; forest land classification and interpretation; forest soil management techniques. Prereq: Soil 501; FoRs 527;/ or permission. Transportation fee. Lab. 4 cr. (Not offered every year.)

614. SOIL MANAGEMENT
Principles of soil management in a rural-urban environment. Course covers various concerns associated with urban development as well as food and fiber production, particularly in terms of their impact on water quality and stewardship of soil resources. Topics include: soil as a waste treatment system, soil and land appraisal, conservation and use of soil resources for economic and aesthetic purposes, and the impact of soil·management on water quality. Prereq: Soil 501. Transportation fee. Lab. 4 cr. (Offered alternate years; next offered Fall, 1986.)

702. CHEMISTRY OF SOILS
Chemical composition of soil; colloidal phenomena and the exchange and fixation of elements, cation exchange capacity and source of negative charge; inorganic reactions in soil and their effect on soil properties. Prereq: one year of college chemistry or permission. 3 cr.

704. SOIL CLASSIFICATION AND MAPPING
Soil genesis, morphology, classification, and mapping; major classification systems used in the U.S. and throughout the world as they relate to human uses of the soil. Prereq: Soil 501; an introductory geology course; /or permission. Transportation fee. 4 cr.

709. SOILS AND COMMUNITY PLANNING
Using a town plan and soils map, students develop reports for multiple urban and rural land use—housing, sewage, recreation, transportation, runoff, etc. USDA soil classification system; Soil Conservation Service rating criteria; New Hampshire soils. Guest lecturers. Prereq: permission. 2 cr.

795. INDEPENDENT WORK IN SOIL SCIENCE
A) Soil-Plant Relationships; B) Physics of Soils; C) Chemistry of Soils; D) Soil Classification; E) Forest Soils. Prereq: permission. 1–4 cr.

Wildlife Management (Wild)

(For program description, see page 51.)

515. WILDLIFE HABITAT MANAGEMENT
Wildlife habitats of New Hampshire; their structural components; useful techniques for creating and managing them. Prereq: course in dendrology or plant identification or permission of instructor. Transportation fee. 3 cr.

533. WILDLIFE ECOLOGY
Principles and factors affecting wildlife populations including historical perspective, population dynamics, habitat requirements, and an overview of wildlife management techniques. Transportation fee. Lab. 4 cr.

609, 610. SEMINAR
Seminars arranged according to student needs. A) Fire Ecology; B) Urban Wildlife; C) Waterfowl; D) Social, Political Issues in Wildlife Management. Prereq: junior standing and permission. Transportation fee. Optional lab/field trips. 0–3 cr.

635. WILDLIFE MANAGEMENT TECHNIQUES
Field and laboratory techniques frequently used by wildlife biologists in management and research. Prereq: wildlife management major. 2 cr.

636. WILDLIFE BIOLOGY
Biological and management characteristics of the major categories of wildlife species including upland game birds, small game, big game, furbearers, and nongame. Prereq: Wild 533 or permission. 2 cr.

672. WILDLIFE ENERGETICS
Energy requirements of wildlife species and the manner in which these needs are met in their natural environment. Thermodynamics in ecological systems, energy requirements, food habits, food use efficiency, food availability. Transportation fee. 2 cr.

695. INVESTIGATIONS IN WILDLIFE MANAGEMENT
A) Wildlife Energetics and Physiology; B) Habitat Management; C) Population Dynamics; D) Waterfowl Management; E) Fire Ecology; F) Game Management. Prereq: permission. 1–4 cr.

737. WILDLIFE POPULATION DYNAMICS
Mechanisms that influence and characteristics of terrestrial wildlife populations. Introduction to census methods and computer modeling. Prereq: senior major or permission of instructor. 4 cr.

738. WILDLIFE MANAGEMENT
Habitat evaluation and management of terrestrial vertebrates. Consideration of game, nongame, and fur bearers. Prereq: senior major or permission of instructor. 4 cr.

French and Italian

French (Fren)

(For program description, see page 29.)

CHAIRPERSON: Barbara T. Cooper
ASSOCIATE PROFESSORS: Rose T. Antosiewicz, Barbara T. Cooper
ASSISTANT PROFESSORS: Claire-Lise Malarte, Grover E. Marshall, Patricia Pecoy, Jack A. Yeager
INSTRUCTORS: Eileen LeVan, Ann E. Mullaney

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. All courses are conducted in French unless otherwise noted. Fren 631 is the first course counting toward a major. Students educated in French-speaking countries may not register for courses below the 700 level without permission. Transfer credit will not be given for elementary-level college courses in foreign languages if the student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY FRENCH
For students without previous training in French. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of French in secondary school; however, any such students whose studies of French have been interrupted for a significant period of time should consult the department chairperson about possibly receiving credit.) 4 cr.

501. REVIEW OF FRENCH
Emphasis on active use of spoken French. Review of basic grammar. Labs. Designed primarily for those whose study of French has been interrupted and for those who have had only two years of high school French. 4 cr.

503, 504. INTERMEDIATE FRENCH
Review of grammar with emphasis on the development of reading, writing, speaking, and listening skills. Discussion in French of literary and cultural readings. Labs and films. 4 cr.

525. INTRODUCTION TO FRENCH CIVILIZATION
Introduction to French civilization from a variety of perspectives and topics. Includes historical, geographical, and artistic expressions of French culture. Not for major credit. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

526. INTRODUCTION TO FRANCOPHONE CIVILIZATION
Civilization of French-speaking countries other than France. Includes historical, geographical, and artistic expressions of these cultures. Not for major credit. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

621. FRENCH PROSE IN TRANSLATION
Works affecting French thought from the Renaissance to the modern period. Readings, discussion, papers in English. Not for major credit. 4 cr. (Not offered every year.)

622. FRENCH DRAMA IN TRANSLATION
Major works of comedy, tragedy, and drama. Molière and Racine to the present day. Readings, discussions, papers in English. Not for major credit. 4 cr. (Not offered every year.)

631. FRENCH GRAMMAR AND SPEECH
Thorough review of grammar and practice in oral and written expression. Extensive use of language laboratory. Prereq: Fren 504. Required for majors. 4 cr.

632. FRENCH CONVERSATION
Readings from current French periodicals and from material illustrating various aspects of contemporary France. Emphasis on increasing oral skills through class discussions and reports. Prereq: Fren 631. Labs. 4 cr.

635. TOPICS IN FRENCH CIVILIZATION
Topics drawn from all aspects and periods of French civilization. Prereq: Fren 631. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

636. TOPICS IN FRANCOPHONE CIVILIZATION
Topics drawn from all aspects and periods of Francophone civilizations. Prereq: Fren 631. May be repeated for credit barring duplication of materials. 4 cr. (Not offered every year.)

651, 652. READINGS IN FRENCH LITERATURE
Reading and rigorous oral and written analysis of texts selected to illustrate important themes/genres in French literature. Pre- or coreq: Fren 631. Required for majors. 4 cr.

653. READINGS IN FRANCOPHONE LITERATURE
Readings in French literatures from outside of France (e.g., Quebec, Africa, the Caribbean). Taught in French. Prereq: Fren 631. 4 cr. (Not offered every year.)

685-686. JUNIOR YEAR AT THE UNIVERSITY OF BURGUNDY
Studies at the University of Burgundy (in Dijon, France) for juniors who have completed their sophomore year at UNH and have passed with a grade of B or better Fren 631, Fren 651, and Fren 652. Students are expected to take French courses in each semester of their freshman and sophomore years. Attendance required at orientation sessions during the second semester of sophomore year. Interested students should consult the director of the program. Prereq: permission. (Not for graduate credit.) 32 cr. Cr/F.

758. FRENCH LITERATURE OF THE MIDDLE AGES AND RENAISSANCE
Prereq: Fren 651, 652 or equivalent. 4 cr. (Not offered every year.)

762. 17TH-CENTURY FRENCH LITERATURE
Prereq: Fren 651, 652 or equivalent. 4 cr. (Not offered every year.)

765. 18TH-CENTURY FRENCH LITERATURE
Prereq: Fren 651, 652 or equivalent. 4 cr. (Not offered every year.)

775. 19TH-CENTURY FRENCH LITERATURE
Prereq: Fren 651, 652 or equivalent. 4 cr. (Not offered every year.)

782. 20TH-CENTURY FRENCH LITERATURE
Prereq: Fren 651, 652 or equivalent. 4 cr. (Not offered every year.)

790. ADVANCED LANGUAGE AND STYLE
Translation of literary texts, intensive study of principal techniques of style, explication de textes. Required for major. Prereq: at least two literature courses in French numbered above 652. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. Not for major credit. 4 cr.

795, 796. SPECIAL STUDIES IN FRENCH LANGUAGE AND LITERATURE
Individual guided study of the work of a major author, a genre, or specific topics in literature. Training in bibliography and organization of material. Prereq: permission. 1–4 cr. (Not offered every year.)

798. SEMINAR IN FRENCH LITERATURE
Topics chosen by the instructor. May be repeated for credit barring duplication of material. Prereq: Fren 651, 652; permission. 4 cr. (Not offered every year.)

Italian (Ital)

New students will be assigned to the proper course upon consultation with the section coordinator. Students educated in Italian-speaking countries may not register for courses below the 700 level. Transfer credit will not be given for elementary-level college courses in foreign languages if students have had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY ITALIAN
For students without previous training in Italian. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of Italian in secondary school; however, any such students whose studies of Italian have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

407. ACCELERATED ITALIAN
Ital 401-402 in one semester. Aural comprehension, speaking, writing, reading. Labs. (No credit for students who have had two or more years of Italian in secondary school; however, any such students whose studies of Italian have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 8 cr.

503-504. INTERMEDIATE ITALIAN
A complete review of the fundamentals of grammar and syntax. Selected readings as a general introduction to Italian civilization and culture. Labs. 4 cr.

631. ADVANCED WRITTEN AND SPOKEN ITALIAN
Critical reading, oral and written analysis of texts selected to illustrate different styles and important themes of Italian writers. Prereq: Ital 504 or permission. 4 cr.

651. INTRODUCTION TO ITALIAN CULTURE AND CIVILIZATION I: MIDDLE AGES, RENAISSANCE, BAROQUE
Survey of major representative writers and artists, studied against the backdrop of social and cultural history. Pre- or coreq: Ital 631 or permission. 4 cr.

652. INTRODUCTION TO ITALIAN CULTURE AND CIVILIZATION II: AGE OF ENLIGHTENMENT, ROMANTICISM, MODERNISM
Survey of major representative writers and artists, studied against the backdrop of social and cultural history. Pre- or coreq: Ital 631 or permission. 4 cr.

795, 796. INDEPENDENT STUDY IN ITALIAN LANGUAGE AND LITERATURE
Individual guided study. Prereq: permission. 1–4 cr.

Genetics (Gen)

(For program description, see page 83.)

CHAIRPERSON: Donald M. Green
PROFESSORS: James P. Barrett, Thomas P. Fairchild, Donald M. Green, Harold W. Hocker, Jr., Frank K. Hoornbeek, Yun-Tzu Kiang, J. Brent Loy, Subhash C. Minocha, Lincoln C. Peirce, Owen M. Rogers, Willard E. Urban, Jr., Robert M. Zsigray
ASSOCIATE PROFESSOR: Robert T. Eckert
ASSISTANT PROFESSORS: Roger A. Cady, Thomas Medford Davis, Clyde L. Denis, Florence E. Farber, Anita S. Klein
ADJUNCT ASSISTANT PROFESSORS: Maurice E. Demeritt, Jr., Peter W. Garrett

705. POPULATION GENETICS
Population growth and regulation; genetic variation; factors affecting gene frequency; ecological genetics. Prereq: principles of genetics or permission. 4 cr. (Not offered every year.)

706. GENETICS LABORATORY
Experiments and demonstrations in animal, plant, and microbial genetics and cytogenetics, including research techniques applicable to biochemical, population, and transmission genetics. Prereq: PlSc 604 or Zool 604; /or equivalent principles of genetics course. 3 cr.

740. EVOLUTIONARY BIOLOGY
Origin of life; source of genetic variation; population structure, mechanisms of evolution; molecular evolution; ecological adaptation in animals, plants, and man; community structure and evolution. 4 cr. (Not offered every year.)

771. BIOCHEMICAL GENETICS
Mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Prereq: Bchm 751 or permission. (Also offered as Bchm 771.) 3 cr.

772. INTRODUCTORY LABORATORY IN MOLECULAR GENETIC TECHNIQUES
Introductory laboratory in modern biochemical gene manipulation techniques including the genetic, physical, and enzymatic characterization of gene vectors, gene cloning, construction of genetic probes, and sequencing of nucleic acids. Prereq: Bchm 751-752; either Bchm 771 or Bchm 781. (Also offered as Bchm 772.) 2 cr.

Geography (Geog)

(For program description, see page 30.)

CHAIRPERSON: William H. Wallace
PROFESSOR: William H. Wallace
ASSOCIATE PROFESSORS: Robert L. A. Adams, Alasdair D. Drysdale, Robert G. LeBlanc
ADJUNCT ASSOCIATE PROFESSOR: James W. Cerny

401. REGIONAL GEOGRAPHY OF THE WESTERN WORLD
Major culture areas of the Western world and the unique interaction of human and physical phenomena that produces the distinctive character of these areas. Emphasis is placed upon the manner in which people of different cultures have made use of the opportunities and solved the problems existing in the major regions occupied by Western culture: Europe, the Soviet Union, the Americas, and Australia and New Zealand. 4 cr.

402. REGIONAL GEOGRAPHY OF THE NON-WESTERN WORLD
Major culture areas of the non-Western world and the unique interaction of human and physical phenomena that produces the distinctive character of these areas. Emphasis is placed upon the manner in which people of different cultures have made use of opportunities and solved problems existing in the major regions occupied by non-Western cultures: the Middle East and North Africa, Africa south of the Sahara, and Oriental Asia and the Pacific Islands. 4 cr.

473. THE WEATHER
Introductory treatment of weather phenomena and the physical processes underlying those phenomena. Emphasis upon the nature and variability of New England weather. 4 cr.

512. GEOGRAPHY OF CANADA
Historical and regional geography of Canada. Historical growth; development of its distinctive regions; contemporary prospects and problems. Resource base, exploration, settlement, population growth, cultural contrasts, economic development, and special relationship with the U.S. Required 5-day field trip to Canada. 4 cr. Prereq: permission.

513. GEOGRAPHY OF THE UNITED STATES
Geographical diversity of the U.S.: its physical setting, historical development, and contemporary spatial organization. Distinctive character and problems of major American regions; recent changes in economic, demographic, and social conditions. 4 cr. (Not offered every year.)

531. GEOGRAPHY OF WESTERN EUROPE AND THE MEDITERRANEAN
A regional and topical analysis of Western Europe and the Mediterranean. The geographical diversity of Europe in the context of physical setting and historical development. Present-day problems. 4 cr. (Not offered every year.)

540. GEOGRAPHY OF THE MIDDLE EAST
Environmental, cultural, political-geographic, and ecological foundations of the Middle East. Selected regional problems and issues; e.g., geographical dimensions of the Arab-Israeli conflict, oil, urbanization, population growth, and nomadism. 4 cr.

570. INTRODUCTORY CLIMATOLOGY
Characteristics and world distribution of present climates. Climates of the past and theories of climatic change. Selected topics in applied climatology. 4 cr.

572. PHYSICAL GEOGRAPHY
Factors in the formation and distribution of landforms, soils, and vegetation. Human significance of natural systems. Lab. 4 cr. (Not offered every year.)

581. HUMAN GEOGRAPHY
Differentiation of the world in terms of population, race, language, religion, political territory, and economic life. Collection and critical use of empirical data; emphasis on spatial and ecological analysis. 4 cr.

582. ECONOMIC GEOGRAPHY
Investigation of the manner in which resources and space have been organized for the production of goods and services: agriculture, the extractive industries, manufacturing, and the tertiary sector. Empirical studies, theories of location, and location models. Major contemporary problems and issues in agriculture and food supply, energy sources, industrial readjustment, and transportation. 4 cr. (Not offered every year.)

583. URBAN GEOGRAPHY
The spatial structure of cities and the city system. Emphasis on the North American city and its problems: land use, transportation, political fragmentation, physical environment, and residential patterns. 4 cr.

584. POLITICAL GEOGRAPHY
The interactions between geographic and political phenomena at the sub-national, national, and international levels. Emphasis on geographical aspects of current political problems within and between states. 4 cr.

590. INTRODUCTORY CARTOGRAPHY
Map usage, design, and production; emphasis on special-purpose thematic maps as used in scholarly papers, theses, journals, and books. 4 cr.

610. THE GEOGRAPHY OF NEW ENGLAND
The distinctive physical setting of New England, its settlement and development during the past three centuries, and the present-day problems and opportunities of the region. Three required weekend field excursions near the end of the term. Prereq: permission. 4 cr. (Not offered every year.)

683. HISTORICAL GEOGRAPHY OF THE UNITED STATES
Spatial analysis of Amerindian culture in 1492. European exploration, colonization, population change, economy, urbanization, and ethnicity to

1900. Geographic illusions and their significance. 4 cr. (Not offered every year.)

690. ADVANCED CARTOGRAPHY
Advanced coverage of selected topics: map symbolization, map perception, map projection, contour mapping. Seminar format. Prereq: Geog 590 or permission. 4 cr. (Not offered every year.)

795. SPECIAL PROJECT IN GEOGRAPHY
Readings, library, archival, and field work. Primarily for geography seniors. Prereq: permission. 2 or 4 cr.

797. SEMINAR IN GEOGRAPHY
History of geographic thought, organizing concepts, and techniques of geographic analysis. Definition and investigation of research problems. Primarily for geography seniors. 4 cr. Cr/F.

Geology

(See Earth Sciences.)

German and Russian

CHAIRPERSON: Nancy Lukens
PROFESSOR: Helmut F. Pfanner
ASSOCIATE PROFESSORS: Roger S. Brown, Marron C. Fort, Nancy Lukens
VISITING ASSOCIATE PROFESSOR: Kane-aki Inazumi
ASSISTANT PROFESSORS: Aleksandra Fleszar, James L. Sherman
INSTRUCTOR: Arna Bronstein
LECTURERS: Beverly Radcliffe Pfanner, Deborah W. Roney, James N. Roney

German (Germ)

(For program description, see page 30.)

New students are encouraged to present scores on the German Advanced Placement (AP) Test for UNH course credit and placement at an advanced level. College Board Achievement Test scores should also be presented for placement purposes. No transfer or UNH credit can be given for elementary college foreign language courses if student has had two or more years of that language in secondary school. If seven or more years have elapsed since completion of last course, student may petition the department to take 400-level courses for credit. Students considering a major or minor in German should consult with the department as early as possible in order to plan a meaningful sequence of required and elective courses and, if possible, study abroad. All courses conducted in German unless otherwise indicated.

401-402. ELEMENTARY GERMAN
For students without previous training in German. Aural comprehension, speaking, writing, reading, language labs. No credit for those with two or more years of German in secondary school. 4 cr.

403-404. GERMAN FOR READING KNOWLEDGE
Reading in the natural, physical, and social sciences and the humanities for students without previous training in German. No credit for those with two or more years of German in secondary school. 4 cr.

407. ACCELERATED GERMAN
401-402 in one semester. Intensive practice in all four skills for students without previous training in German. Labs. No credit for those with two or more years of German in secondary school. 8 cr.

501. REVIEW OF GERMAN
Refresher course for those whose study of German has been interrupted or who have had no more than two years of high school German. Emphasis on oral-aural practice; review of basic structures; reading and writing to develop active command of the language. Labs. 4 cr.

503-504. INTERMEDIATE GERMAN
Review of grammar; practice in oral and written expression; readings and cultural material. Prereq: Germ 401-402 or equivalent. Labs. 4 cr.

521. MAJOR GERMAN AUTHORS IN ENGLISH
Selected masterpieces of the 19th and 20th centuries by authors such as Goethe, Heine, Mann, Kafka, Hesse, Brecht, Aichinger, Frisch, and Dürrenmatt. Readings and discussions in English. Course cannot be used toward the German major, but is recommended as an elective for both majors and nonmajors. 4 cr.

525. INTRODUCTION TO GERMAN CULTURE AND CIVILIZATION
Aspects of the political, social, and cultural life of the two Germanys (FRG and GDR), Austria, and Switzerland. Conducted in English. Required of German majors; strongly recommended for any students planning study abroad in a German-speaking country. 4 cr.

526. INTRODUCTION TO GERMAN LITERATURE
Reading and analysis of poems, dramas, and short prose; introduction to theory of literary forms and methods of analysis. Required of all German majors; prerequisite to upper-level literature courses. 4 cr.

575. GERMAN CONVERSATION AND PHONETICS
Intensive oral practice with emphasis on pronunciation and vocabulary building. Discussions and short reports on topics of current interest. Required of all German majors and strongly recommended for students planning to study abroad. Prereq: German 504 or equivalent. 4 cr.

631-632. ADVANCED LANGUAGE AND STYLE
Essays and oral reports; practice in idiomatic usage and sentence structure. This sequence required of German majors and minors; not open to returnees from junior year abroad programs that offer equivalent courses. 4 cr.

645. CONTEMPORARY GERMAN LITERATURE
Literary trends in the German-speaking countries since 1945. Analysis and interpretation of works by major authors. 4 cr.

685, 686. STUDY ABROAD
A summer, semester, or year of study in one or a combination of the departmentally recognized programs at the Institute of European Studies in Freiburg, West Germany, or Vienna, Austria, or with

the University of Cincinnati in Hamburg, West Germany, or other appropriate programs. Open to students of any major with Germ 504 or equivalent training. Financial aid applies to all approved programs. Interested students should inquire at department for program brochures and specific requirements and should apply in consultation with a German adviser. For information on other study abroad programs, students should contact the Center for International Perspectives. Variable to 16 cr.

721. GERMAN CULTURE AND CIVILIZATION
Historical, social, artistic, and folkloristic developments in German-speaking countries from the beginning to the present. Prereq: Germ 525 or permission of instructor. 4 cr.

723. SURVEY OF PRECLASSICAL GERMAN LITERATURE
Lecture and readings in German literature from its Germanic beginnings to the Enlightenment. Prereq: Germ 526. 4 cr.

724. THE AGE OF GOETHE
Major literary movements between 1770 and 1832. Reading and analysis of selected works. Prereq: Germ 526. 4 cr.

727. GERMAN LITERATURE OF THE 19th CENTURY
Major literary movements from Goethe's death to the unification of Germany by Bismarck (1832–1872). Reading and analysis of selected works. Prereq: Germ 526. 4 cr.

728. MODERN GERMAN LITERATURE
Major literary movements from 1872 to 1945. Reading and analysis of selected works. Prereq: Germ 526. 4 cr.

733. HISTORY AND DEVELOPMENT OF THE GERMAN LANGUAGE
The changes in sounds, structure, and vocabulary from the earliest record to the present. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills, including developments in computer-assisted instruction. Prereq: permission of instructor. 4 cr.

795, 796. INDEPENDENT STUDY
Open to highly qualified juniors and seniors. To be elected only with permission of the department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit. 1–4 cr.

797, 798. SPECIAL STUDIES IN GERMAN LANGUAGE AND LITERATURE
A) Cultural Comparison of the U.S. and Germany; B) North Germany: Land and People; C) Masterworks of German Cinema; D) German and Austrian Exile Literature 1933–1945; E) German for Graduate Students; F) Berlin and the Berliners; G) Translation of German Poetry. Barring duplication of subject, may be repeated for credit. 2 cr.

Japanese (Japn)

New students will be assigned to the proper course on the basis of an achievement test. Transfer credit will not be given for elementary-level college courses in foreign language if a student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY JAPANESE
Elements of Japanese grammar. Oral practice and written drills designed to achieve a mastery of basic grammatical patterns. Reading of graded exercises introducing the student to written Japanese (Hiragana and Katakana) and Chinese characters used in contemporary Japan. Labs. (No credit for students who have had two or more years of Japanese in secondary school; however, any such students whose studies of Japanese have been interrupted for a significant period of time should consult the department chairperson about possibly receiving credit.) 4 cr.

503-504. INTERMEDIATE JAPANESE
Review of Japanese grammar. Reading of prose and practice in oral and written expression. Emphasis upon contemporary Japanese. Labs. Prereq: Japn 402 with a grade of C (2.00) or better or permission of instructor. 4 cr.

631-632. ADVANCED JAPANESE
Advanced spoken and written Japanese to maintain aural-oral fluency. Advanced reading and composition. Prereq: Japn 504 or permission of instructor. 4 cr.

695, 696. INDEPENDENT STUDY IN JAPANESE
Open to highly qualified juniors and seniors. To be elected only with the permission of department chairperson and of the supervising faculty member or members. Barring duplication of subject, may be repeated for credit. 1–4 cr.

Russian (Russ)

(For program description, see page 35.)

New students will be assigned to the proper course on the basis of an achievement test. Transfer credit will not be given for elementary-level college courses in foreign languages if a student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY RUSSIAN
Oral-aural practice and written drills designed to achieve a mastery of basic grammatical patterns. Language Laboratory work required. Previous knowledge of Russian not required. (No credit for students who have had two or more years of Russian in secondary school; however, any such students whose studies of Russian have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

425. INTRODUCTION TO THE SOVIET UNION THROUGH POST-REVOLUTIONARY LITERATURE
An introduction to contemporary Soviet society through 20th-century Soviet literature. Emphasis on the structure of the Soviet society as expressed through art and literature. 4 cr.

503-504. INTERMEDIATE RUSSIAN
Continuation of Russ 401-402. Review of Russian grammar, and practice in oral and written expression. Prereq: Russ 402 or equivalent high school or college course with a grade of C or better. 4 cr.

505, 506. RUSSIAN CONVERSATION, READING, & PHONETICS
Designed to increase fluency in Russian conversation and reading and to improve phonetic articulation. Students are advised to take this as a sequence along with Russ 503-504. Prereq: Russ 401-402 or permission. 4 cr.

521. SURVEY OF RUSSIAN LITERATURE IN ENGLISH
Selected masterpieces of 19th- and 20th-century Russian literature. Pushkin, Gogol, Tolstoy, Dostoevsky, Chekhov, Pasternak, Solzhenitsyn, and others. Lectures and readings in English. Open to all students, including freshmen. 4 cr.

525. INTRODUCTION TO RUSSIAN CULTURE AND CIVILIZATION
A survey course, thematically organized, drawing upon Russian and Soviet literature, history, politics, art, and ideological currents to create a composite portrait of the evolution of Russian and Soviet culture. (Also offered as Hist 563.) 4 cr.

585. RUSSIAN LANGUAGE SEMINAR IN THE SOVIET UNION
Five weeks of Russian language classes on all levels conducted in Leningrad, 4 hours per day, 6 days per week. No prerequisites. 4 cr. (Summers only.)

586. RUSSIAN LANGUAGE SEMINAR, CIVILIZATION, AND CULTURE IN THE SOVIET UNION
Five weeks of culture and civilization classes and field trips to museums, art galleries, schools, factories, etc. Classes and excursions average 3 hours per day, 7 days per week. No prerequisites. 1–4 cr. (Summers only.)

593. MAJOR RUSSIAN AUTHORS IN ENGLISH
In-depth discussion and analysis of major Russian authors or literary periods. A different author or period offered each semester. Lectures and readings in English. Not for major credit; majors must register for Russian 693. 4 cr.

631-632. ADVANCED RUSSIAN CONVERSATION AND COMPOSITION
Advanced spoken and written Russian designed to maintain aural-oral fluency; advanced grammar. Prereq: Russ 503-504 or equivalent. 4 cr.

691. READINGS IN RUSSIAN LITERATURE
Linguistic and stylistic characteristics of the works covered in Russ 521. Readings and lectures entirely in Russian. 4 cr.

692. DRAMA
Taught in Russian, as a complement to Russ 693. Plays chosen to parallel the authors covered in Russ 521 or 693. Final project is a play production. 2 cr.

693. MAJOR RUSSIAN AUTHORS
Same as Russ 593, except that majors do selected readings in Russian and conduct in-depth research on a specified topic. Final project required. 4 cr.

733. ADVANCED LANGUAGE AND STYLE
For students who have a strong, active control of grammar. The most difficult problems of Russian grammar and syntax; poetry and prose. Develops confidence in expression both in everyday situations and in abstract concepts (emphasis on the latter). 4 cr.

734. HISTORY AND DEVELOPMENT OF THE RUSSIAN LANGUAGE
Overview of the changes in sounds, structure, and vocabulary from Proto-Indoeuropean through Old Church Slavonic, Old Russian, to Contemporary Russian. Emphasis on changes in the literary language from the end of the 18th century to the present. Readings in Old Church Slavonic, Old Russian, and 19th- and 20th-century authors. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795, 796. INDEPENDENT STUDY IN RUSSIAN
Open to highly qualified juniors and seniors. To be elected only with permission of the section coordinator and the supervising faculty member or members. Barring duplication of subject, may be repeated for credit. 1–4 cr.

797, 798. SPECIAL STUDIES IN RUSSIAN LANGUAGE AND LITERATURE
Selected topics in language, culture, and literature. 2 or 4 cr.

Gerontology (Gero)

(For program description, see page 83.)

Coordinator: Juliette Petillo

600. INTRODUCTION TO GERONTOLOGY
Primarily for minors but open to other students, this course introduces students to the study of normal aging and to the applied practice of service to the aging. 4 cr.

795. INDEPENDENT STUDY
Practical experience with elderly under supervision of designated faculty. 4 cr.

(See Nursing 670 for ISSUES IN HEALTH CARE OF THE AGED.)

Greek

(See Spanish and Classics.)

Health Administration and Planning (HAP)

(For program description, see page 70.)

CHAIRPERSON: John W. Seavey
PROFESSOR: Basil J. F. Mott
ASSOCIATE PROFESSORS: Marc D. Hiller, John W. Seavey, Lee F. Seidel

ADJUNCT ASSOCIATE PROFESSORS: Francis F. Cronin, Sylvio L. Dupuis, Martin D. Merry, Donald E. Nicoll, Peter H. Patterson, Marc E. Voyvodich, William T. Wallace
ASSISTANT PROFESSORS: Robin Gorsky, Richard J. A. Lewis, Eileen A. O'Neil
ADJUNCT ASSISTANT PROFESSORS: Andrew F. Coburn, Leonard M. Kielson, Richard G. Warner

401. U.S. HEALTH CARE SYSTEMS
Nature and functions of health care services and health professionals; impact of social, political, economic, legal, and technological forces. Current health problems. 4 cr.

402. PUBLIC HEALTH AND EPIDEMIOLOGY
Survey of the major environmental, communicable, genetic, and chronic health problems in the U.S. and the public response to them; introduction to the basic concepts and uses of epidemiology. 4 cr.

403. SEMINAR ON HEALTH AND MEDICAL CARE SYSTEMS
Focuses on health and how interactions between physical and social environment affect health; nature and function of medical care and public health services including impact of social, political, economic, legal, and technical forces. (Not open to students who have completed either HAP 401 or HAP 402.) 8 cr.

502. FUNDAMENTALS OF MEDICAL CARE DELIVERY
Language, methodologies, and values used in medical diagnosis and treatment decisions. Concepts of professionalization and socialization among clinicians and patients. Ethical and social implications of medical, technological, and administrative interventions in the delivery of medical care. Prereq: major or permission. 4 cr.

600. SPECIAL TOPICS
A) Hospital Administration; B) Long-term Care Administration; C) Ambulatory Care Administration; D) Clinical Services Administration; E) Home Care Administration; F) Mental Health Administration; G–Z) Interdisciplinary. Prereq: junior major or permission. May repeat, but not duplicate subject areas. 1–4 cr.

621. PREPRACTICUM SEMINAR
Preparation for field practicum experience, orientation to experiential learning and competency development. Prereq: major. 2 cr.

622. FIELD PRACTICUM
Work experience in a hospital, nursing home, neighborhood health center, health-planning agency, or other health organization. Application of theories to practice. Supervision by agency personnel. Prereq: junior major; permission. 16 cr.

623. HEALTH ADMINISTRATION AND PLANNING: INTERNSHIP
Professional experience in health administration and planning with evaluation to determine competency. Prereq: senior major and permission. An instructor may assign an "IA" grade (continuing course) at end of one semester. 10–16 cr. Cr/F.

630. ETHICAL ISSUES IN HEALTH CARE
Critical examination of ethical and legal issues confronting the health care professions and biomedical research/technology. Analysis of decision making as it affects the individual, the health care institution, and society. 4 cr. (Not offered every year.)

695. INDEPENDENT STUDY
In-depth study with faculty supervision. Prereq: permission of major adviser and faculty of the area concerned. 2–4 cr.

700. HEALTH ADMINISTRATION AND PLANNING: COMPETENCY ASSESSMENT
Examination and/or evaluation to determine level of competency within the five program competency areas. Normally students will be granted up to 12 credits each for competencies A-D (generic areas) and up to 16 credits for competency E (area of specialized interest). A. Describe, analyze, and interpret the context in which health services are delivered; including social, economic, political, professional, technical, and historical dimensions; B. Describe, analyze, and interpret the nature and functions of health institutions and programs, including their planning, financing, operation, and regulation; C. Apply qualitative and quantitative planning and administrative methodologies in the design, implementation, and evaluation of health policies and programs; D. Analyze, develop, and implement administrative and planning strategies for health services through the interactions among health care and/or other human service organizations; E. Develop specialized knowledge of one or more health areas as related to institutions: hospitals and clinics, long-term care, primary care, planning, environmental health, regulation, health financing, insurance, and mental health. Prereq: major and permission, not open to students who have had HAP 622 or HAP 623. An instructor may assign an "IA" grade (continuing course) at the end of one semester. 16–64 cr. Cr/F.

721. HOSPITAL AND HEALTH SERVICES ADMINISTRATION
Theories and practices of administration in health care institutions; application and analysis of various administrative processes and techniques in a health context. Prereq: major or permission. 4 cr.

723. HEALTH PLANNING
Theoretical and historical foundations of health planning; the relationship of health planning and regulation; the application of planning methods; and the utilization of strategic planning and its relationships to marketing. Prereq: major or permission. 4 cr.

730. MANAGEMENT INFORMATION SYSTEMS IN HEALTH CARE INSTITUTIONS
Application of management information systems to medical and administrative problems of health care institutions. Concepts and techniques of systems design, implementation, and evaluation. 4 cr. (Not offered every year.)

732. ORGANIZATION OF HEALTH SERVICES: AN INVENTORY AND ANALYSIS
Identification and examination of institutions that comprise the health care system. Analysis of interaction of health organization with political, economic, and other social systems. Prereq: permission. 4 cr.

734. HEALTH LAW
Concepts and principles of law as these affect medical and administrative decision making in health care institutions and the ability to discern issues that warrant the advice and/or assistance of legal counsel. Topics covered include, among others, corporations and antitrust, property law, patients' rights under law, and malpractice. 4 cr.

740. MANAGEMENT ACCOUNTING FOR HEALTH CARE ORGANIZATIONS
Cost accounting, cost analysis, and budgeting in planning and controlling health care operations. Techniques of variance analysis, cost allocation, ratio analysis and management of working capital, concepts of capital investment decision analysis, rate setting, and reimbursement. Prereq: major or permission. 4 cr.

741. QUANTITATIVE METHODS FOR HEALTH CARE ORGANIZATIONS
Methods to increase efficiency of health care organizations, including decision analysis, cost-benefit analysis, linear programming, queueing, regression, as well as descriptive analysis and projection methodologies. Prereq: major or permission. 4 cr.

742. MULTI-INSTITUTIONAL HEALTH CARE SYSTEMS
Complex health problems and interorganizational response. Theories for evaluating and designing interorganizational systems. Prereq: major or permission. 4 cr.

750. COMPARATIVE HEALTH CARE SYSTEMS
An analysis and comparison of world health problems and delivery systems using nations with different cultures, political and economic systems, and stages of economic development. Methods for developing and evaluating health care systems. 4 cr.

795. SENIOR INTEGRATING PAPER
Preparation of a research paper on a topic of significance to health administration and planning. Prereq: senior major; permission. 2 cr.

Health Studies

(See School of Health Studies.)

History (Hist)

(For program description, see page 31.)

CHAIRPERSON: Hans Heilbronner
PROFESSORS: Charles E. Clark, Robert C. Gilmore, Hans Heilbronner, Charles A. Jellison, Jr., William R. Jones, David F. Long, Francis D. McCann, Jr., Robert M. Mennel, Harvard Sitkoff, John O. Voll, Douglas L. Wheeler, Donald J. Wilcox
ASSOCIATE PROFESSORS: Jeffry M. Diefendorf, Marion E. James, Allen B. Linden, Janet L. Polasky, Marc L. Schwarz
ASSISTANT PROFESSORS: John W. Harris, Jr., Laurel Ulrich, Ann L. Zulawski
LECTURER: Christine L. Compston

400. INTRODUCTION TO HISTORICAL PERSPECTIVES
Seminar for freshmen and sophomores. In-depth exploration of a particular historical question or topic; for example, the French Revolution, Chaucer's England, or the New Deal. Students should consult with the history department for a list of topics and instructors. 4 cr.

401. HISTORICAL ENCOUNTERS
Modular, one-semester course focusing on specific theme in world history, such as war and peace, revolutions, or the family. Consult the department for the year's topic. Lectures and small group discussions. 4 cr.

425. FOREIGN CULTURES
Introduction to the culture of a particular nation or region; preparation for experiencing a foreign culture. Consult department for listing of topics. 4 cr.

500. INTRODUCTION TO HISTORICAL THINKING
Basic skills essential to the study of history: critical reading of historical literature, improvement of written and oral analysis of historical material, and use of library resources. Intensive study of books and documents from varying historical fields and periods. Required of history majors; open to other interested students. 4 cr.

Group I. American History

402. INTRODUCTION TO THE AMERICAN EXPERIENCE
Three related topics in American history, combining lectures and discussion groups in each of three modules. Emphasis on orientation of the beginning student to the use of primary source materials and elementary historical methods. 4 cr.

403, 404. HISTORY OF THE UNITED STATES
American history from settlement to the present. Political, social, economic, and diplomatic aspects. Not open to students who elect Hist 510. 4 cr.

505, 506. AFRO-AMERICAN HISTORY
Experiences, aspirations, and contributions of Black Americans from their ethnic origins in Africa to the present American crisis in race relations; comparative study of cultures and institutions. 4 cr.

507. NATIVE PEOPLES OF THE AMERICAS
Indian societies of the American continents, their reactions to and interactions with the Europeans who invaded and conquered them. Emphasis on North America. 4 cr.

510. HISTORICAL SURVEY OF AMERICAN CIVILIZATION
Topical survey, within broad chronological divisions, of the development of American civilization since 1600. Not open to students who elect Hist 403 or 404. 4 cr.

511. HISTORY OF NEW HAMPSHIRE
From presettlement times to the present, emphasizing the use of locally available materials and sources. 4 cr. (Not offered every year.)

566. WOMEN IN AMERICAN HISTORY
Key changes in women's roles in the past three centuries with an emphasis upon the peculiarities of the American setting. How, for example, were women's lives affected by: the frontier; the intersection of European, African, and native American

cultures; religious diversity; the problem of defining citizenship in a democratic republic? Students will sample recent scholarship in women's history and study a wide variety of documents produced by women. 4 cr.

603. EARLY AMERICAN HISTORY
The development of an Anglo-American society and culture along the eastern seaboard of North America, 1600–1750. 4 cr.

605, 606. AMERICA IN THE 18TH CENTURY AND THE REVOLUTION
American colonial and revolutionary history from 1740 through the adoption of the constitution and the establishment of Washington's first administration. 4 cr.

610. AMERICAN STUDIES: NEW ENGLAND CULTURE IN CHANGING TIMES
A team of three instructors from history, literature, and art investigate major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as Arts 610, Engl 610, and Huma 610.) Not for art studio major credit. 4 cr.

611, 612. 19TH-CENTURY AMERICA
Domestic and international factors in the development of the American republic, its institutions and people, from the inception of the new nation in 1789 to the emergence of the United States as a world power in 1900. 4 cr.

615, 616. 20TH-CENTURY AMERICA
U.S. after 1900; cultural, political, and social factors causing major changes in American life. Semester I: Progressivism through the New Deal. Semester II: World War II to the present. 4 cr.

619, 620. THE FOREIGN RELATIONS OF THE UNITED STATES
Primarily the history of American diplomacy, with attention given to the nondiplomatic aspects. Semester I: American Revolution to 1890. Semester II: 1890 to date. 4 cr.

621, 622. HISTORY OF AMERICAN THOUGHT
Significant American thinkers considered in their social context. Semester I: 1600 to 1860. Semester II: 1860 to present. 4 cr. (Not offered every year.)

624. AMERICAN URBAN HISTORY
Urbanization process from the colonial period to the present. 4 cr.

Group II. European History

435, 436. WESTERN CIVILIZATION
The classical origins and evolution of European civilization through the Renaissance, Reformation, and voyages of discovery. The rise of Europe to global supremacy in the 19th century and its transformation in the 20th century. 4 cr.

521. HISTORY OF SCIENCE (TO THE RENAISSANCE)
Prehistoric techniques, Pythagoreanism and Greek rationalism, concept of the universe, neo-Platonism and the Newtonian synthesis, history of atomism. 4 cr.

522. HISTORY OF SCIENCE (POST-RENAISSANCE)
Idea of the past, evolution; matter, energy, light; rise and decline of classical physical science; history of relativity and the quantum theory. Prereq: Hist 521 or permission. 4 cr.

559, 560. HISTORY OF GREAT BRITAIN
History of Great Britain from the earliest times to the present; from social, constitutional, economic, political, and intellectual perspectives. Designed for history students as well as those interested in literature, western political and social systems, American studies, education, and prelaw. 4 cr.

563. INTRODUCTION TO RUSSIAN CULTURE AND CIVILIZATION
A survey course, thematically organized, drawing upon Russian and Soviet literature, history, politics, art, and ideological currents to create a composite portrait of the evolution of Russian and Soviet culture. (Also offered as Russ 525.) 4 cr.

565. WOMEN IN MODERN EUROPE
A social history of women in Europe from 1700 to the present. The course will examine the development of the "modern nuclear family," transformations in women's work during the industrial revolution, and women's political evolution from bread rioters to hearth tenders to petitioners. Sources include published diaries, historiographical studies, and novels. 4 cr.

639, 640. THREE MEDIEVAL CIVILIZATIONS
Demise of classical antiquity in the lands bordering the Mediterranean, and the genesis and fruition of three new cultural traditions: Latin Christian, Islamic, and Byzantine. Religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. 4 cr.

641. AGE OF THE RENAISSANCE
The birth of the Renaissance, its economic, social, and political roots, and the flowering of Renaissance culture. Covers period from 1300 to 1600, with stress on Italy. 4 cr.

642. THE AGE OF REFORMATION
The reformation of church, society, and human values that shook Europe in the 16th century, and its roots in the 14th and 15th centuries. 4 cr.

647. FRANCE FROM LOUIS XIV THROUGH THE FRENCH REVOLUTION
Pressures and influences that led to the French Revolution. 4 cr.

648. MODERN FRANCE
French society from Napoleon to Mitterand. Topics include the Revolution of 1848 and the Paris Commune; World Wars and the Vichy regime; Existentialism, DeGaulle, and the Revolt of May-June 1968. 4 cr.

651, 652. EUROPEAN INTELLECTUAL HISTORY
European intellectual tradition from the Greek philosophers to the end of World War II. How basic ideas have developed out of previous modes of thought in response to new challenges. 4 cr.

656. 20TH-CENTURY EUROPE
World War I, European totalitarianisms, World War II, the loss of European primacy, and the search for a new Europe. 4 cr.

659. HISTORY OF MODERN SPAIN AND PORTUGAL
Iberian states and their peoples from the coming of liberalism to the present. Failure of Iberian liberalism and liberal government. Political and social change, imperial and intellectual movements, influence of Western European thought and activity. 4 cr.

661, 662. ENGLAND IN THE TUDOR AND STUART PERIODS
Political, religious, socio-economic, and intellectual forces for change at work in England from the accession of Henry VII to the revolution of 1688–89. 4 cr.

663. RUSSIA: ORIGINS TO MODERNIZATION
Russia from its foundation to emancipation and reform. Political developments, foreign relations, intellectual and ideological currents. 4 cr.

664. RUSSIA: FROM TSARIST TO SOVIET EMPIRE
The cost of modernization; Leninist and Stalinist revolutions; Soviet consolidation. 4 cr.

667. EARLY MODERN GERMANY: REFORMATION TO THE REVOLUTION OF 1848
Conflict between Holy Roman Empire and petty states; rise of Prussia; religious conflict and Enlightenment. 4 cr.

668. MODERN GERMANY SINCE 1848
Bismarck and Imperial Germany; Weimar and the rise of Hitler; post-World War II-divided Germany. 4 cr.

Group III. Non-Western History

421. WORLD HISTORY
Major world civilizations; interrelationships in time and space among the different human societies. Social, cultural, and political factors of the human experience. 4 cr.

531, 532. LATIN AMERICAN HISTORY
Semester I: Amerindian America and the European conquest and domination to the last half of the 18th century. Semester II: problems of identity, integration, and nationalism, with analysis directed at selected national areas (e.g., Brazil, Mexico, Argentina, and Cuba), plus attempts at generalization. 4 cr.

575. THE ANCIENT NEAR EAST
From the neolithic revolution to the time of Alexander the Great. Rise of civilization; nature of human artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt; Judaism in its historical setting. 4 cr.

576. THE AEGEAN WORLD
History of Greece and the Aegean area from Crete to the time of Alexander the Great in 323 B.C. 4 cr.

579. HISTORY OF CHINA: FROM EMPIRE TO PEOPLE'S REPUBLIC
The origins and development of Chinese civilization and its revolutionary transformation in modern times. Institutional and cultural changes will be stressed. 4 cr.

580. HISTORY OF JAPAN: FROM YAMATO TO TOKYO
The development of Japanese civilization from its origins to the present. Special attention will be paid to the transformation of Japan from an agrarian to an industrial society. 4 cr.

585, 586. THE HISTORY OF THE MIDDLE EAST
From the time of Muhammad to the present. Semester I: origins and expansion of Islam and the nature of medieval Islamic civilization. Semester II: Ottoman history, relations with European powers, and emergence of modern nations in the Middle East. 4 cr.

587, 588. HISTORY OF AFRICA SOUTH OF THE SAHARA
From ancient times to the present. Semester I: from prehistoric times to 1870. Semester II: from 1870 to the present. African migrations, kingdoms and societies; African responses to the slave trade; Islam; European imperialism, colonialism, and industrialization; African nationalism, independence, and postindependence problems. 4 cr.

590. THE CITY IN HISTORY
The preindustrial and modern city as a philosophical and cultural institution, with emphasis on city design and architecture. Certain great cities, such as Athens, Florence, Paris of 1900, and Berlin of the 1920s, will be dealt with in detail. 4 cr.

631. LATIN AMERICAN HISTORY: REGIONAL OR COUNTRY STUDIES
Seminar; readings and discussions of literature relative to region or country being studied. See department listing for the current semester's topics. Students will be guided through preparation of a research proposal. Hist 531, 532 recommended. 4 cr.

632. LATIN AMERICAN HISTORY: TOPICAL STUDIES
Thematic seminar; reading and discussions of literature relative to selected topics. See the department listing for the current semester. Students will be guided through preparation of a research proposal. Hist 531, 532 recommended. 4 cr.

677. THE HELLENISTIC-ROMAN WORLD
The Mediterranean and Near East from the time of Alexander to the reign of Constantine. Covers the main political and social developments, but stresses artistic, scientific, philosophical, and religious trends, with particular emphasis on the rise of Christianity, Zoroastrianism, and the general religious climate that prepared the way for Islam. 4 cr.

681. MODERN CHINA TOPICS
Issues in modern Chinese history, 1800 to present. Students will read and discuss major works concerning the semester's topic and write several book reports and a term paper. The topic for a given semester will be posted in the history department office. Hist 579 is recommended. 4 cr.

683. RELIGION IN WORLD HISTORY
The religious experience of man from the perspective of world history. The major modes of religion; development of the major religious traditions and institutions. 4 cr.

684. HISTORY OF SOUTHERN AFRICA SINCE 1820
Struggle for political and economic control in the only region of Africa where European groups remain in power. Impact of European imperialism, European-settler nationalism, racial conflict, economic competition and industrialization, apartheid, and assimilation with special attention to development of European hegemony. Official American policy. 4 cr.

685. THE MODERN MIDDLE EAST
From 18th century to the present. Problems created by modernization and reform of the traditional society; conservative reaction to reform, impact of nationalism, and appearance of new ideologies. 4 cr.

Group IV. Special Courses

595, 596. EXPLORATIONS IN HISTORY
See department listings for semester topic. 1–4 cr.

600. ADVANCED EXPLORATIONS IN HISTORY
See department listings for semester topic. Barring duplication of subject, may be repeated for credit. 1–4 cr.

695, 696. INDEPENDENT STUDY
A) Early American History; B) American National History; C) Canada; D) Latin America; E) Medieval History; F) Early Modern Europe; G) Modern European History; H) Ancient History; I) Far East and India; J) Near East and Africa; K) European Historiography; L) American Historiography; M) Russia; N) World History; O) English History; P) New Hampshire History; Q) Historical Methodology; R) Irish History. For students showing a special aptitude in history who desire to study an area or subject for which no appropriate course is offered. Prereq: permission. 4 or 8 cr.

774. HISTORIOGRAPHY
Analysis of ancient and modern historians. Required of all entering Ph.D. candidates; open to undergraduates with permission. 4 cr. (Not offered every year.)

775. HISTORICAL METHODS
Contemporary historical methods. Required of all entering Ph.D. candidates; open to undergraduates with permission. 4 cr. (Not offered every year.)

789. SEMINAR IN THE HISTORY OF SCIENCE
Selected topics conducted through special lectures, individual study, oral and written reports. Subject varies. Cannot be used for credit in history without permission of the department. Prereq: permission. 4 cr.

790. QUANTIFICATION AND COMPUTERS FOR THE HISTORIAN
The historian's use of computers and statistics; practical applications of both interactive terminal operations and batch processing. Data generation and processing, computer languages (BASIC, FORTRAN), programming and library programs, elementary statistics; students will undertake operations of their own on material supplied and will consider particular quantitative studies in history in terms of techniques used. No previous knowledge of computers or college mathematics required. Prereq: admission as an undergraduate major or graduate student in history; /or permission. 4 cr.

797. COLLOQUIUM IN HISTORY
Selected topics in American, European, and non-Western history. Required of history majors. Students must select section in the department office at the time of registration. 4 cr.

Hotel Administration (Hotl)

(For program description, see page 80.)

PROGRAM DIRECTOR: Raymond J. Goodman, Jr.
ASSOCIATE PROFESSORS: Raymond J. Goodman, Jr., Neil Ross Porta, Melvin Sandler
LECTURERS: Michael A. Leven, Sylvia Marple, Burton W. Thomas

403. FOOD AND BEVERAGE MANAGEMENT
Food service and lodging industry. Application of classroom principles through lectures, field trips, food labs, catering for on-campus functions, and participation in gourmet dinner productions. 4 cr.

556. LODGING OPERATIONS AND PHYSICAL STRUCTURES MANAGEMENT
Components of physical structures as functional units; students compare and contrast aspects of rooms division management in large and small hotels, including reservations, front office operations and accounting, housekeeping, and auxiliary functions. 4 cr.

618. FINANCIAL ANALYSIS AND CONTROL
Managerial accounting concepts and techniques applicable to hospitality and service industries. Prereq: Admn 403. 4 cr.

655. HOTEL DEVELOPMENT
Issues related to the development and pre-opening operation of hotel property, including: site selection and evaluation; layout and design; types of ownership; management contracts and franchising; and market and financial feasibility. Includes a major group project involving all aspects of hotel development. Prereq: Hotl 556; Admn 653. 4 cr.

667. ADVANCED FOOD AND BEVERAGE MANAGEMENT
Integration of management principles and techniques. Presentation of large-scale gourmet dinners; serve as consultants to on-campus food service facilities; individual research projects. Prereq: Hotl 403. 4 cr.

695. INDEPENDENT ANALYSIS
Study and research project for honor students to advance knowledge in lodging and food services fields. Prereq: senior standing and permission. 2–16 cr.

698. TOPICS IN HOTEL ADMINISTRATION
Special topics and developments in lodging and food services industries. Prereq: senior standing and permission. 4 cr.

700. HOSPITALITY MARKETING MANAGEMENT
Provides opportunity to apply to lodging and food service industries the principles learned in basic marketing course. Lectures, guest speakers, projects. Prereq: Admn 651. 4 cr.

701. HOSPITALITY INDUSTRY PROJECTS
Industry consultation projects that fulfill an organization's need while providing students with problem analysis and decision opportunities. Client reports and presentations are required. Prereq: senior standing or permission. 4 cr.

702. HOTEL DEVELOPMENT
Financial management, business planning, and data processing principles and applications in hotels and restaurants. Students will apply techniques learned in class through use of a microcomputer and the development of a comprehensive business plan. Prereq: senior standing or permission. 4 cr.

703. HOSPITALITY INDUSTRY BUSINESS POLICY
Capstone course interrelating and applying principles and concepts from Administration, Economics, and Hotel Administration courses. Cases, current industry information, field visits, and projects may be employed. Prereq: all hotel major requirements. 4 cr.

771. BEVERAGE MANAGEMENT
Examination of purchasing, evaluation, storage, service, and control of alcoholic beverages. Emphasis on wines, although beer, ale, distilled spirits, liqueurs, and mixed drinks are examined. Prereq: Hotl 667 or permission. 4 cr.

795. INTERNSHIP
Fieldwork in an organization for on-the-job skill development. Normally supervision is provided by a qualified individual in the organization, with frequent consultation by a faculty sponsor. A written report is required of the student. Internships may be part-time or full-time, with course credits assigned accordingly. 1–16 cr.

798. SEMINAR
Special topics in hotel administration covering material not normally covered in the regular curriculum. Prereq: permission. 1–4 cr.

Humanities (Huma)

(For program description, see page 31.)

COORDINATOR, HUMANITIES PROGRAM: Warren R. Brown
COORDINATOR, HUMANITIES 401: Donna B. Brown
CORE FACULTY: David S. Andrew, Arts; Rose T. Antosiewicz, French and Italian; Donna B. Brown, Humanities; Warren R. Brown, Political Science; Richard J. Callan, Spanish and Classics; R. Alberto Casás, Spanish and Classics; Charles E. Clark, History; David E. Leary, Psychology; Charles H. Leighton, Spanish and Classics; Barbara S. Tovey, Philosophy; David H. Watters, English.

401. INTRODUCTION TO THE HUMANITIES
Modular course with changing theme. Typically includes twelve to fifteen different mini-courses in art, music, literature, philosophy, and history. Students assigned three modules after indicating preferences at initial class. May be repeated for credit if different sections taken. For current theme, see Humanities 401 Coordinator. 4 cr.

501. HUMANITIES: THE ANCIENT WORLD
Appreciation of literature, the arts, and philosophy. Roots of Western civilization: Homer, Greek tragedy, Plato, Aristotle, the Bible, Vergil. Weekly lecture series, slides, films, visit to Boston museums. 4 cr.

502. HUMANITIES: THE MODERN WORLD
Literature, philosophy, and art from Dante through the French and Russian realists. Dante, Castiglione, Machiavelli, Montaigne, Racine, Moliere, Pope, Goethe, Wordsworth, Zola, Tolstoy. Weekly lecture series, slides, films, visit to Boston museums. 4 cr.

503. HUMANITIES: THE 20TH CENTURY
Literature, philosophy, and art of Western civilization in the last hundred years. 4 cr.

595. SPECIAL STUDIES IN THE HUMANITIES
Selected topics not covered by existing courses, with subjects to vary. May be repeated for credit. 2 or 4 cr.

609. ETHNICITY IN AMERICA: THE BLACK EXPERIENCE IN THE TWENTIETH CENTURY
Team-taught course investigating music, literature, and social history of Black America in the period of the Harlem Renaissance, in the Great Depression, World War II, and in the 1960s. Special attention to the theme of accommodation with and rejection of dominant white culture. (Also offered as Engl 609 and Musi 609.) 4 cr.

610. REGIONAL STUDIES IN AMERICA: NEW ENGLAND CULTURE IN CHANGING TIMES
Team-taught course investigating some of the major contributions New England has made to American life. Focus on three periods: the Puritan era, 1620–90; the Transcendental period, 1830–60; and the period of emerging industrialism in the late 19th century. Prereq: second semester sophomore. (Also offered as Hist 610, Engl 610, and Arts 610.) Not for art studio major credit. 4 cr.

650. HUMANITIES AND THE LAW: THE PROBLEM OF JUSTICE IN WESTERN CIVILIZATION
Interdisciplinary modular course examines interpretations of the nature of justice, its origins, the role of the professional judiciary, and the relationship of law and ethics. Students take four successive 3½-week modules during the semester. Prereq: junior or senior standing or permission. 4 cr.

651. HUMANITIES AND SCIENCE: THE NATURE OF SCIENTIFIC CREATIVITY
Interdisciplinary modular course examines the historical and intellectual foundations of the physical, biological, and human sciences. Students take three successive 5-week modules during the semester. 4 cr.

699. SENIOR PROJECT IN HUMANITIES
Independent study open only to senior humanities majors with individual project approved and supervised by faculty. 2–6 cr.

Hydrology

(For program description, see page 54.)

(For courses, see Earth Sciences and Forest Resources.)

Intercollege Courses (Inco)

401. NUCLEAR WAR
Physics of nuclear weapons; delivery systems; defense concepts; effects of nuclear exchange; military, political, economic, and psychological aspects of the arms race; peace movement. 4 cr.

491. COMPUTER LITERACY
Provides an understanding of the components of computers and how they work; the various applications of computers and their impact on society and the individual. Emphasis on using microcomputers for writing programs to solve simple problems. 491A: intended for students with no previous computer experience; 491B: intended for students who have had a high school course in computer literacy that included programming. Not open to students who have completed Admn 526, C S 406, C S 410, DCE 491, or E E 405. Seven weeks; lab fee $10; enrollment limit of 50 per section. 2 cr. Cr/F.

598, 599. INDEPENDENT WORK-STUDY
(598 off-campus, 599 on-campus). These courses enable students to pursue a semester of independent study in disciplines not within the purview of a particular department. Students select the area in which they wish to work, create their own bibliography for reflection, and find their own channels to pursue the problem actively. Students must write a proposal identifying the manner in which they intend to pursue the study and obtain the sponsorship of a faculty member. The proposal, with the faculty sponsor's endorsement, should be submitted to the Teaching-Learning Committee of the appropriate college, via the college dean's office for approval.

685, 686. STUDY ABROAD
Enables students to pursue a semester or an academic year of foreign study in programs other than those offered by UNH. Students must provide the University Committee on Foreign Study with detailed information about the curriculum and must receive approval from that committee before registration. Credit awarded only upon successful completion of the course of study and after receipt by the committee of an official transcript. Interested students should consult the Center for International Perspectives. Prereq: permission. (Financial aid requires a minimum of 6 credits.) Variable to 16 credits. Cr/F.

International Perspectives Program

(See Program for International Perspectives.)

Italian

(See French and Italian.)

Japanese

(See German and Russian.)

Justice Studies (Just)

(For program description, see page 25.)

601. FIELD EXPERIENCE IN JUSTICE STUDIES
Placement by the justice studies coordinator in a position related to the justice system (e.g., criminal courts, corrections, civil courts, law firms, policy-making agencies, law enforcement agencies); weekly seminar meetings. Prereq: permission. 4 or 8 cr. Cr/F.

797. SPECIAL TOPICS IN JUSTICE STUDIES
One course will be offered each year by cooperating faculty on a topic of special interest to the justice studies program but not normally offered on a regular basis in any department; intended to provide a common experience at an advanced level for students minoring in justice studies. 4 cr.

Latin

(See Spanish and Classics.)

Leisure Management and Tourism (LM T)

(For program description, see page 71.)

CHAIRPERSON: Gus C. Zaso
ADJUNCT PROFESSORS: Phyllis R. Gelineau, Wilbur F. LaPage, Raymond E. Leonard
ASSOCIATE PROFESSOR: Gus C. Zaso
ADJUNCT ASSOCIATE PROFESSORS: Herbert L. Echelberger, Bernard E. Thorn
ASSISTANT PROFESSORS: Larry Gustke, Ann L. Morgan, Lou G. Powell
ADJUNCT ASSISTANT PROFESSORS: Brian E. Doyle, Thomas A. More, Michael T. Rhodes

400. IMPACT OF LEISURE
Issues that contribute to the emergence of a leisure-oriented society and significant problems that accompany the expansion of leisure opportunities. 4 cr.

455. INTRODUCTION TO RECREATION AND PARK SERVICES
Role of recreation and parks in contemporary society. 4 cr.

501. LEISURE SERVICES FOR THE HANDICAPPED
Practical aspects of leisure service delivery for handicapped individuals who are in the mainstream of society. 4 cr.

502. INTRODUCTION TO THERAPEUTIC RECREATION
History and professional concepts of therapeutic recreation and the roles and functions of the therapeutic recreator. 4 cr.

544. OUTDOOR EDUCATION
Elements of programming as they relate to the school curriculum and school camping. 4 cr.

554. RECREATION BUSINESS MANAGEMENT
Principles of business management and managerial problem solving as applied to the operation of recreation facilities, parks, and tourist attractions. Emphasizes knowledge in both the public and private sectors: personnel and financial management, market analysis, promotion, and the protection and maintenance of facilities and resources. Prereq: majors only with LM T 455 or permission. 4 cr.

557. LEISURE SERVICE PROGRAM DESIGN
Introduces the student to a systems approach to program design. Course topics include: needs assessment techniques, goal setting and objectives writing, process of group planning, public relations, program evaluation, and leisure education. Applied projects are required. Prereq: LM T 455 or permission. 4 cr.

558. PROGRAM SUPERVISION AND LEADERSHIP
Emphasis on specific knowledge of leisure activity categories with related organization and leadership techniques. Other topics include: facilitation of activity throughout the lifespan; planning for instruction, safety, and crisis confrontation. Applied projects are required. Prereq: LM T 557 or permission. 4 cr.

560. CAMPUS RECREATION SERVICES
Management of college unions and campus recreation resources in higher education. 4 cr.

561. INTRODUCTION TO OUTDOOR RECREATION
The history, delivery system, social and economic impacts, and management tools for outdoor recreation. Includes identification of contemporary issues, problems, and opportunities in recreation resource management. Lab. 4 cr.

593. SPECIAL TOPICS
A) Camping and Outdoor Education for the Handicapped; B) State Parks: Their Management and Role; C) Music in Recreation. Specialized courses covering information not presented in regular course offerings. Description of topics available in department office during preregistration. Prereq: LM T majors or permission. May be repeated but not in duplicate areas. 2–4 cr.

603. PRINCIPLES OF THERAPEUTIC RECREATION
Addresses the principles of activity analysis, client leisure assessment, individualized program planning, and evaluation. Prereq: LM T 455; 502. 4 cr.

604. CLINICAL ASPECTS & TECHNIQUES IN THERAPEUTIC RECREATION
Basic terminology, adaptive devices and techniques, transfers, and recording. Prereq: LM T 455; 502. 4 cr.

661. TOURISM AND PARK MANAGEMENT
Contemporary, comparative park land and tourist attraction management techniques and principles are discussed to highlight the dynamic and pluralistic nature of the field. Focus on large parklands, nature preserves, wilderness areas, water bodies, and coastal resources. The interrelationship of parklands and tourism with the economy, politics, and social change to understand the past and future of professional park and tourism management. Required course for students in the tourism and park management option and juniors in forest management. Prereq: LM T 554 or permission. 4 cr.

663. RECREATION AND PARK ADMINISTRATION
A comparative analysis of administrative processes within various organizations as well as the political and policy-making roles of managers in the public and private sector. Emphasis on organizational development, fiscal management, and budgeting as tools used in formulating and implementing policy. Prereq: LM T 455 and 557 or permission. 4 cr.

664. INTERNSHIP
A) Internship in Program Administration; B) Internship in Therapeutic Recreation; C) Internship in Tourism and Park Management. Students enroll in the section corresponding to their major option after receiving approval from the academic adviser. Supervised work experience in an approved park, recreation, tourism, or health service agency. An "IA" grade (year-long course) may be assigned at the end of the first semester or summer session. Prereq: majors only. 4–8 cr. Cr/F.

665. INFORMATION RETRIEVAL AND COMMUNICATION IN LEISURE SERVICES
Prepares students to respond effectively to an information-based society. Course topics are applied to the leisure service delivery systems and include microcomputer systems and applications; standardized information systems; networking; understanding and disseminating descriptive research; and dissemination of information through audiovisual and mass media. Prereq: LM T 557 or permission. 4 cr.

667. TOURISM AND PARK PLANNING
An overview of planning for parks, recreation, and tourism, as currently practiced, from national planning to individual site planning. Relationships of planning to management, policy, and practice; current trends in planning and likely future directions. Extensive use of field trips, especially coastal parkland resources, for students to learn how to "read" landscapes in order to use natural features in design as well as to enhance visitor experiences. Because of the field trips, students should schedule no other classes on the afternoon of this class meeting. Prereq: LM T 554; LM T major or permission. 4 cr.

743. ENVIRONMENTAL EDUCATION
A blend of environmental education/interpretation theory, process, and practical application. Includes seminars, workshops, and "hands-on" experience in an environmental education program. Prereq: permission. 4 cr.

766. IMPACTS OF TOURISM
Social, economic, environmental, political, and psychological consequences of tourism examined through use of case studies. The scope is international, dealing with island and coastal environments. The geography, history, and future of tourism; its planning, management, and marketing. Focus is on the "attraction" segment of the tourist industry as opposed to the travel and accommodation segments. Required course for students in

the tourism and park management option; others admitted if space permits. Prereq: junior/senior LM T major or permission. 4 cr.

772. LAW OF RECREATION RESOURCES AND LEISURE SERVICES
Topics including the law of torts, contracts, property, civil rights, risk management, and legal research are addressed in the context of recreation resources and leisure services. Application of professional advocacy techniques related to legislative process is required. Prereq: senior LM T major or permission. 4 cr.

793. ADVANCED TOPICS
A) Area and Site Planning. Topics presented by instructors with specialized knowledge gained through professional practice, research, and study. Description of topics available in department office during preregistration. May be repeated but not in duplicate areas. 4 cr.

796. INDEPENDENT STUDY
Individual study and/or research relating to leisure-oriented topics. 1–4 cr.

798. RECREATION AND LEISURE RESEARCH SEMINAR
Reviews of problems, trends, and current practices. 4 cr.

Linguistics (Ling)

(For program description, see page 32.)

See also the list of courses approved for the major or minor at the linguistics entry in the front of this catalog.

505. INTRODUCTION TO LINGUISTICS
An overview of the study of language: animal communication vs. human language, universal properties of human language, Chomsky's innateness hypothesis, language acquisition in children, dialects and language variation, language change. Includes an introduction to modern grammar (phonology, syntax, and semantics) and to scientific linguistic methodology. (Also offered as Engl 505.) 4 cr.

506. INTRODUCTION TO COMPARATIVE AND HISTORICAL LINGUISTICS
Major language families (primarily Indo-European) and the relationships among languages within a family. Diachronic studies; methods of writing; linguistic change; glottochronology; etymological studies. Some language training and Ling 505 desirable. (Also offered as Clas 506.) 4 cr.

790. SPECIAL TOPICS IN LINGUISTIC THEORY
An advanced course on a topic chosen by the instructor. Inquire at the English Department office for a full course description each time the course is offered. Topics such as word formation, dialectology, linguistic theory and language acquisition, history of linguistics, language and culture, cross-disciplinary studies relating to linguistics. Barring duplication of subject, may be repeated for credit. (Also offered as Engl 790.) 4 cr.

793. PHONETICS AND PHONOLOGY
The sound system of English and of other languages as viewed from the standpoint of modern linguistic theory, including the following topics: the acoustic and articulatory properties of speech sounds, the phonemic repertoires of particular languages, phonological derivations, and prosodic phenomena such as stress and intonation. Prereq: a basic linguistics course or permission. (Also offered as Engl 793.) 4 cr.

794. SYNTAX AND SEMANTIC THEORY
The relationship of grammar and meaning as viewed from the standpoint of modern linguistic theory. Emphasis on the syntax and semantics of English, with special attention to the construction of arguments for or against particular analyses. Prereq: a basic linguistics course or permission. (Also offered as Engl 794.) 4 cr.

795, 796. INDEPENDENT STUDY
A) Synchronic Linguistics; B) Diachronic Linguistics; C) Linguistic Theory. For students showing a special aptitude for linguistics who desire to pursue a line of inquiry for which no appropriate course is offered. All requests must be forwarded by the faculty sponsor to the director of the Interdepartmental Linguistics Committee. 1–4 cr.

Mathematics (Math)

(For program description, see page 63.)

CHAIRPERSON: Richard H. Balomenos
PROFESSORS: Richard H. Balomenos, Homer F. Bechtell, Jr., David M. Burton, Arthur H. Copeland, Jr., Donald W. Hadwin, A. Robb Jacoby, Loren D. Meeker, Eric A. Nordgren, James Radlow, Shepley L. Ross, Albert O. Shar, Robert J. Silverman, Donovan H. Van Osdol
ASSOCIATE PROFESSORS: Albert B. Bennett, Jr., William E. Bonnice, Marie A. Gaudard, William E. Geeslin, Berrien Moore III, Samuel D. Shore
ASSISTANT PROFESSORS: Kenneth B. Constantine, Joan Ferrini-Mundy, Edward K. Hinson, Sie-Keung Tse, Lee L. Zia

401. ELEMENTARY MATH I
Beginning algebra including integer operations, solving linear equations, graphing linear functions, solving linear inequalities, systems of linear equations, polynomials, rational expressions and equations, and exponents and radicals. Students with one or more years of college preparatory mathematics are not eligible for credit. 0 or 4 cr.

402. ELEMENTARY MATH II
Review of elementary algebra, exponents, polynomials, factoring, rational exponents, and absolute value. Solving linear and quadratic equations and inequalities; systems of equations; radical equations. Linear functions and related notions (slope, distance, midpoint); quadratic functions. Students with two or more years of college preparatory mathematics are not eligible for credit. Prereq: Math 401 or one year of high school algebra. 0 or 4 cr.

405. ELEMENTARY FUNCTIONS
Properties of elementary functions, including exponential and logarithmic, trigonometric and inverse trigonometric functions. Students with three or more years of college preparatory mathematics are not eligible for credit. Prereq: Math 402 or two years of high school algebra. 0 or 4 cr.

419. EVOLUTION OF MATHEMATICS
Mathematics from antiquity to the present; origins of the various methods and branches. How and why such concepts, as number and geometry, evolved. Prereq: two college preparatory mathematics units. Credit offered to math majors in mathematics education only. 4 cr.

420. FINITE MATHEMATICS
Topics selected from: logic, set theory, probability, linear algebra, linear programming, game theory, and graph theory. Not a preparation for calculus. Prereq: two college preparatory math units. Not offered for credit to math majors. 4 cr.

Note for calculus students: Students enrolling in Math 425 are given a test on algebra and trigonometry during the first week of the semester. Those doing unsatisfactory work will be required to take Math 405 before enrolling in calculus or to complete remedial assignments in the Mathematics Center (Ma C) concurrently with Math 425.

425. CALCULUS I
Calculus of one variable covering limits; derivatives of algebraic, trigonometric, and logarithmic functions; applications include curve sketching, max-min, related rates, and volume and area problems. A special testing program. Prereq: three college preparatory math units including trigonometry. 4 cr.

426. CALCULUS II
Second course in calculus of one argument, techniques of integration, polar coordinates, and series. Lectures, individual assignments, and a special testing program. Prereq: Math 425. 4 cr.

527. DIFFERENTIAL EQUATIONS WITH LINEAR ALGEBRA
Fundamental methods of solving first order equations, essentials of matrix algebra; higher order linear equations, and linear systems; series solutions; Laplace transforms; selected applications. Prereq: Math 426. 4 cr.

528. MULTIDIMENSIONAL CALCULUS
Partial differentiation; composite functions and chain rules; maximum and minimum; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; divergence, Green and Stokes theorems. Prereq: Math 426. 4 cr.

531. MATHEMATICAL PROOF
A course designed to introduce the student to the nature of mathematical proof. Subject matter will vary from section to section. Offered in the following subject matter areas: A) Logic and Set Theory; B) Linear Algebra; C) Discrete Math Structures (restricted to C S and C S option majors); D) Calculus. Prereq: Math 426. 4 cr.

536. INTRODUCTORY STATISTICAL INFERENCE
Elementary probability, samples, populations, estimators, sampling distributions, confidence, intervals, hypothesis testing, analysis of variance, simple linear regression, correlation, contingency tables, tests of goodness-of-fit and independence. Prereq: two years of high school algebra. Not offered for credit if credit is received for Math 644 or Math 735. 4 cr.

621. NUMBER SYSTEMS FOR ELEMENTARY SCHOOL TEACHERS
Counting and set concepts, whole numbers, fractions, negative numbers, real numbers, numeration systems, inductive and deductive reasoning. Mathematical laboratory approach. Prereq: permission. Credit offered to mathematics majors in elementary education only. 4 cr.

622. GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS
Deductive systems, metric geometry, congruence, symmetry, similarity, transformation, measurement, polygons and circles, polyhedra. Mathematical laboratory approach. Prereq: Math 621. Credit offered to mathematics majors in elementary education only. 4 cr. (Offered in alternate years.)

623. TOPICS FOR ELEMENTARY SCHOOL TEACHERS
Logic, mathematical systems, permutations, combinations, probability, and introduction to statistics. Mathematical laboratory approach. Prereq: Math 621. Credit offered to mathematics majors in elementary education only. 4 cr. (Offered in alternate years.)

644. PROBABILITY AND STATISTICS FOR APPLICATIONS
Probability concepts, random variables, parameter estimation, hypothesis testing, quality control, and quality assurance. Prereq: Math 426. Not offered for credit if credit is received for Math 735.) 4 cr.

645. LINEAR ALGEBRA FOR APPLICATIONS
Applied matrix theory; eigenvalue problems and their applications in mathematics, physics, and engineering; systems of linear ordinary differential equations. Computer methods will be used. Prereq: C S 410F; Math 426. Not offered for credit if credit received for Math 762. 4 cr.

646. ANALYSIS FOR APPLICATIONS
Initial-boundary-value problems of mathematical physics; Sturm-Liouville problems; series expansions by orthogonal functions; Green's functions; numerical methods. Prereq: C S 410; Math 527; 528 or equivalent computer experience. 4 cr.

647. COMPLEX ANALYSIS FOR APPLICATIONS
Complex numbers; complex integration; infinite series; contour integration; conformal mapping; Fourier and Laplace transforms; Weiner-Hopf techniques. Prereq: Math 528. Not offered for credit if credit received for Math 788. 4 cr.

651. COMBINATORICS
Arrangements and selections, generating functions, recurrence relations, inclusion-exclusion formulas, and elementary graph theory. Prereq: Math 531 or Phil 550. 4 cr.

656. INTRODUCTION TO NUMBER THEORY
Unique factorization, arithmetic functions, linear and quadratic congruences, quadratic reciprocity law, quadratic forms, introduction to algebraic numbers. Prereq: Math 531. 4 cr. (Offered in alternate years.)

657. GEOMETRY
Advanced approach to fundamental properties of Euclidean and other geometries. Prereq: Math 531. 4 cr.

658. TOPICS IN GEOMETRY
Topics to be selected from among projective geometry, finite geometrics, convexity, transformational geometry, non-Euclidean geometry, and other areas of elementary geometry within the framework of modern mathematics. Prereq: Math 657. 4 cr. (Offered in alternate years.)

682. NONLINEAR DIFFERENTIAL EQUATIONS
Phase plane analysis of linear and nonlinear autonomous systems; solutions, paths, and critical points; nonlinear conservative systems; limit cycles; periodic solutions; approximate methods; stability of solutions; applications. Prereq: Math 527. 4 cr. (Offered in alternate years.)

696. INDEPENDENT STUDY
Projects of interest and value to student and department. Prereq: permission of faculty supervisor and department chairperson. 1–6 cr.

698. SENIOR SEMINAR
Exploration of mathematical topics outside the standard undergraduate curricula. Focus on problem solving, generation of problems, and explaining mathematical concepts. Prereq: Senior standing in mathematics or mathematics education. 4 cr.

703. MATHEMATICS EDUCATION, K-6
Methods of teaching geometry and the basic operations; mathematics objectives; introduction to research in mathematics education; elementary curriculum projects. Prereq: Math 621. 2–4 cr.

730. ADVANCED APPLICATIONS OF PROBABILITY AND STATISTICS
Probability concepts, random variables, parameter estimation, hypothesis testing. Additional topics chosen from analysis of variance, regression, chi-squared methodology, nonparametric statistics, or (approved) student project. Prereq: Math 426 (or equivalent) and permission. Not offered for credit if credit received for Math 644, 735, or 736. 4 cr.

735. PROBABILITY
Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson, and normal distributions; limit theorems for sums of random variables. Prereq: Math 528. Not offered for credit if credit is received for Math 644. 4 cr.

736. STATISTICS
Sampling theory, parameter estimation, hypothesis testing, regression, analysis of variance, nonparametric methods. Prereq: Math 735. 4 cr.

737. DECISION THEORY AND BAYESIAN METHODS
Utility, decision problems, prior and posterior distributions, sufficiency, estimation and hypothesis testing, linear models, and sequential sampling. Emphasis on applications to business and economics. Prereq: Math 735. (Also offered as Econ 737.) 4 cr. (Offered in alternate years.)

738. MULTIVARIATE STATISTICAL ANALYSIS
Multivariate distributions, estimation and hypothesis testing, principal components, canonical correlations, factor analysis, discriminant analysis. Prereq: Math 736 and either Math 645 or Math 762. 4 cr. (Offered in alternate years.)

739. LINEAR STATISTICAL MODELS
Estimation, testing, and diagnostic methods for linear regression; analysis of variance; and analysis of covariance. Some use of packaged statistical computer programs. Prereq: Math 644 or Math 736; and Math 645 or Math 762. 4 cr. (Offered in alternate years.)

740. NONPARAMETRIC STATISTICAL METHODS
Methods of nonparametric statistical inference for one-sample and two-sample problems, one-way and two-way layouts, correlation, and regression. Prereq: Math 644 or Math 736. 4 cr. (Offered in alternate years.)

742. STATISTICS INTERNSHIP
Analysis of data in a consultant setting; statistical methodology necessary for the project; use of the computer. 2–6 credits/semester; course can be repeated for a maximum of 8 credits.

745-746. FOUNDATIONS OF APPLIED MATHEMATICS
The basic concepts and techniques of applied mathematics intended for graduate students in mathematics, engineering, and the sciences. Fourier series and transforms, Laplace transforms, optimization, linear spaces, eigenvalues, Sturm-Liouville systems, numerical methods, conformal mapping, residue theory. Prereq: Math 527; 528, or equivalent. 4 cr.

753. NUMERICAL METHODS AND COMPUTERS I
Use of scientific subroutine and plotter routine packages, floating point arithmetic, polynomial and cubic spline interpolation, implementation problems for linear and nonlinear equations, random numbers and Monte Carlo method, Romberg's method, optimization techniques. Selected algorithms will be programmed for computer solution. Prereq: Math 426; C S 410 and C S 410F. (Also offered as C S 753.) 4 cr.

754. NUMERICAL METHODS AND COMPUTERS II
Mathematical software. Computer solutions of differential equations; eigenvalues and eigenvectors. Prereq: Math 527; C S 410 and C S 410F. (Also offered as C S 754.) 4 cr.

761. ABSTRACT ALGEBRA
Basic properties of groups, rings, fields, and their homomorphisms. Prereq: Math 531. 4 cr.

762. LINEAR ALGEBRA
Abstract vector spaces, linear transformations and matrices, determinants, eigenvalues and eigenvectors. Prereq: Math 761. Not offered for credit if credit received for Math 645. 4 cr.

764. ADVANCED ALGEBRA
Topics selected from: rings, modules, algebraic fields, and group theory. Prereq: Math 761. 4 cr. (Offered in alternate years.)

767. ONE-DIMENSIONAL REAL ANALYSIS
Theory of limits, continuity, differentiability, integrability. Prereq: Math 531. 4 cr.

768. ADVANCED ANALYSIS
Metric spaces; sequences and series of real functions; uniform convergence; Fourier Series; differentiability of mappings from n-spaces to m-spaces. Prereq: Math 767. 4 cr. (Offered in alternate years.)

776. LOGIC
Induction and recursion; sentential logic; first-order logic; completeness, consistency, and decidability; recursive function. Prereq: Math 531 (preferably section A). 4 cr. (Offered in alternate years.)

783. SET THEORY
Axiomatic set theory, including its history, Zermelo-Fraenkel axioms, ordinal and cardinal numbers, consistency, independence, and undecidability. Prereq: Math 531. 4 cr. (Offered in alternate years.)

784. TOPOLOGY
Open sets, closure, base, and continuous functions. Connectedness, compactness, separation axioms and metrizability. Prereq: Math 531. 4 cr.

788. COMPLEX ANALYSIS
Complex functions, sequences, limits, differentiation and Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula, Taylor's and Laurent's series, residues, conformal mapping. Prereq: Math 767. Not offered for credit if credit received for Math 647. 4 cr.

791. MATHEMATICS EDUCATION
Methods of teaching secondary school mathematics with particular attention to: curricula and instructional materials; teaching reading in mathematics; problem solving; theories of learning mathematics; computers and calculators; and professional organizations and publications. Prereq: Educ 500; Math 426; and permission. 4 cr.

Mechanical Engineering (M E)

(For program description, see page 66.)

CHAIRPERSON: Charles K. Taft
PROFESSORS: Robert W. Corell, David E. Limbert, Godfrey H. Savage, Charles K. Taft, Russell L. Valentine
ASSOCIATE PROFESSORS: Sedat Biringen, Barbaros Celikkol, Frederick G. Hochgraf, William Mosberg, M. Robinson Swift, John A. Wilson
ASSISTANT PROFESSORS: Kenneth C. Baldwin, James E. Krzanowski, Robert Edwin Phillips
RESEARCH ASSISTANT PROFESSOR: Raymond G. Gauthier

401. INTRODUCTION TO MECHANICAL ENGINEERING
Goals and interactions of mechanical engineering in contemporary society. Basic concepts presented and developed as background for future course work. Lectures, case studies, and laboratories. 4 cr.

441. ENGINEERING GRAPHICS
Fundamentals of engineering drawing and descriptive geometry developed for graphical communication of technical information and solution of spatial problems. 4 cr.

503. THERMODYNAMICS
Laws of thermodynamics and their relation to working substances. Prereq: Math 426. 3 cr.

508. FLUID DYNAMICS
Dynamics and thermodynamics of compressible and incompressible fluid flow; behavior of fluids as expressed by hydrostatic, continuity, momentum, and energy equations. Prereq: M E 503; M E 527. 3 cr.

523. INTRODUCTION TO STATICS AND DYNAMICS
An overview of statics and dynamics; two- and three-dimensional force systems; laws of equilibrium; moments of area; volume; inertia; stresses and strains; particle and rigid body dynamics; fixed and moving reference frames; impulse-momentum principles; work-energy relationships. Prereq: Math 426; Phys 407. Not for M E majors. 3 cr.

525. MECHANICS I
An introduction to statics. Two- and three-dimensional force systems, the concept of equilibrium, analysis of trusses and frames, centroids, bending moment and shear force diagrams, friction, and stress-strain relationships. Prereq: Math 425 and 426; Phys 407. 3 cr.

526. MECHANICS II
An introduction to strength of materials. Analysis of members under torsion, axial, shear and bending stresses, superposition of stresses, stability of columns. Prereq: M E 525. 3 cr.

527. MECHANICS III
An introduction to particle and rigid body dynamics. Rectilinear and curvilinear motion, translation and rotation, momentum and impulse principles, and work-energy relationships. Prereq: M E 525 or permission. 3 cr.

541. MANUFACTURING PROCESSES AND DESIGN
Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. Lab. 4 cr.

545. MATERIALS LABORATORY
Laboratory experiments on the structure and engineering properties of metals, plastics, and ceramics. Coreq or prereq: M E 561. Lab. 1 cr.

546. MECHANICS LABORATORY
Experimental determination of mechanical properties of structural materials under various loading configurations. Coreq or prereq: M E 526. Lab. 1 cr.

547. THERMAL SCIENCE LABORATORY
Experimental studies and performance testing of thermal/fluid devices and systems. Prereq or coreq: M E 503. 2 cr.

561. INTRODUCTION TO MATERIALS SCIENCE
Theoretical and experimental studies of the structure and properties of solids. Prereq: Chem 405 or equivalent. 3 cr.

564. MATERIALS II
Relationship of atomic, micro, and macro structures of materials to their mechanical properties, processing for structure; materials use in an evolving technology. Prereq: M E 561. 3 cr.

603. HEAT TRANSFER
Analysis of phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. Co- or prereq: M E 508. 3 cr.

605. THERMAL SYSTEM ANALYSIS AND DESIGN
Applications of the laws of thermodynamics to the analysis and design of real systems. Behavior of real media, non-reactive and reactive mixtures, power and refrigeration cycles. Prereq: M E 503, 547, 603. 3 cr.

629. KINEMATICS AND DYNAMICS OF MACHINES
Kinematic and dynamic analysis of mechanisms and their synthesis. Applications to reciprocating engines; balancing and cam dynamics are developed. 3 cr.

643. ELEMENTS OF DESIGN
Analysis, synthesis, and design of machine elements and systems. Development of engineering judgment; selection of materials stress and failure analysis; kinematic arrangements; design for finite and infinite life. Open-ended design problems unify course topics. Prereq: M E 526, M E 564. 3 cr.

648. SYSTEMS MODELING AND EXPERIMENTATION I
Lumped parameter models for mechanical, electrical, and mixed systems. Matrix representations, eigenvalues, eigenvectors, time domain solutions, and frequency response plots are used to explore system response. Use and analysis of instrumentation. Prereq: M E 629; coreq: E E 536. Lab. 3 cr.

655. DESIGN PROCESS
Introduction to basic approaches to technical innovation and managing the necessary accompanying activities from identification of need through initial funding and generation of alternative solutions, to final product or project completion. Requirements and some of the techniques for responsible technical/economic decision making. Prereq: Senior in engineering or permission of instructor. 2 cr.

695. SPECIAL TOPICS IN MECHANICAL ENGINEERING
Course topics not offered in other courses. May be repeated for credit. 2–4 cr.

696. MECHANICAL ENGINEERING PROJECTS
Analytical, experimental, or design projects undertaken individually or in teams under faculty guidance. May be repeated for credit. 1–4 cr.

697. MECHANICAL ENGINEERING SEMINAR
Study and discussion of engineering topics, with student-faculty participation. May be repeated for credit. 1 cr.

701. MACROSCOPIC THERMODYNAMICS
Thermodynamic principles using an analytic, postulational approach and Legendre transformations to obtain thermodynamic potentials. 4 cr.

702. STATISTICAL THERMODYNAMICS
Macroscopic thermodynamic principles developed by means of microscopic analysis. Prereq: M E 503. 4 cr.

707. ANALYTICAL FLUID DYNAMICS
Development of the Navier-Stokes equations; vorticity theorems; turbulence and boundary-layer theory. Prereq: M E 508. 4 cr.

708. GAS DYNAMICS
Basic equations of motion of one-dimensional, subsonic, and supersonic flows of compressible, ideal fluids. Wave phenomena. Rankine-Hugoniot relations. Linear approach to two-dimensional flow problems. Prereq: M E 508. 4 cr.

709. COMPUTATIONAL FLUID DYNAMICS
Solution of basic finite-difference methods for incompressible and compressible flows, with practical examples. Treatment of boundary/initial conditions, analysis of stability, and convergence of the numerical schemes. Prereq: M E 508; M E 603 or permission. 4 cr.

710. SOLAR HEATING SYSTEMS
Analysis and computer modeling of solar radiation as an energy source for heating. Phenomena, availability, collection, performance, and economy of solar energy for heating systems. Prereq: M E 603. 3 cr.

717. CRYOGENICS
Phenomena and processes at very low temperatures. Basic engineering sciences applied to problems of low temperature refrigeration, liquefaction, separation, and storage; transport of cryogenic fluids; measurement systems; vacuum technology. Prereq: M E 503. 4 cr.

723. ADVANCED DYNAMICS
Classical dynamics oriented to contemporary engineering applications. Review of particle dynamics. Hamilton's principle and the Lagrange equations. Kinematics and dynamics of rigid bodies, gyroscopic effects in machinery and space structures. 4 cr.

724. VIBRATION THEORY AND APPLICATIONS
Discrete vibrating systems. Linear system concepts; single-degree-of-freedom system with general excitation. Matrix theory and eigenvalue problems. Many degrees of freedom, normal mode theory for free and forced vibration. Numerical methods; introduction to continuous systems; applications to structural and mechanical systems. Prereq: M E 628. 4 cr.

726. EXPERIMENTAL MECHANICS
Experimental methods and theoretical bases applied to measurement of stress, strain, and motion. Transmitted and scattered-light photoelasticity; strain gage applications; brittle coating and grid techniques; dynamic measurements, and associated instrumentation. 4 cr.

727. ADVANCED MECHANICS OF SOLIDS
Beams on elastic foundation, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods, and numerical methods. 4 cr.

730. MECHANICAL BEHAVIOR OF MATERIALS
Elastic and inelastic behavior of materials in terms of micro- and macromechanics. Stress, strain, and constitutive relations related to recent developments in dislocation theory and other phenomena on the atomic scale and to the continuum mechanics on the macroscopic scale. Elasticity, plasticity, viscoelasticity, creep, fracture, and damping. Anisotropic and heterogeneous materials. 4 cr.

741. NONLINEAR SYSTEMS MODELING
Modeling of hydraulic, pneumatic, and electromechanical systems. Solution methods including linearization and computer simulation of nonlinear equations. Methods of generalizing the nonlinear models for design purposes are developed. (Also offered as E E 741.)4 cr.

749. SYSTEMS MODELING & EXPERIMENTATION II
Lumped parameter models for thermal, fluid, and mixed systems. Matrix representations and response evaluation techniques. Design of systems for desired responses. Use and analysis of instrumentation. Minicomputer data acquisition, curve fitting, and error analysis. Prereq: M E 648. Lab. 3 cr.

751. NAVAL ARCHITECTURE IN OCEAN ENGINEERING
Selected topics in the fundamentals of naval architecture pertinent to ocean engineering, including hydrostatic characteristics, basics of resistance and propulsion and rules and regulations for surface, semisubmersible, and submersible marine vehicles. Computer applications. Prereq: M E 508; M E 525; /or permission. (Also offered as O E 751.) 4 cr.

752. SUBMERSIBLE VEHICLE SYSTEMS DESIGN
Conceptual and preliminary design of submersible vehicle systems; submersibles, environmental factors, hydromechanic and structural principles, materials, intra/extravehicle systems, operating considerations. predesign and design procedures. Design projects selected and completed by student teams. Prereq: permission. (Also offered as O E 752.) 4 cr.

757. COASTAL ENGINEERING AND PROCESSES
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. Prereq: M E 508 or permission. 3 cr.

760. PHYSICAL METALLURGY I
Introduction to the electron theory of metals, intermetallic compounds, ferro magnetism, dislocations, and slip phenomena. 4 cr.

766. PHYSICAL CERAMICS
Characteristics of crystalline and noncrystalline ceramic solids; defect structures; diffusion in ceramic materials; nucleation and crystal growth, spinodal decomposition, and solid-state reactions; kinetics of grain growth; sintering, and vitrification. Prereq: permission. 4 cr.

774. COMPUTER-AIDED ENGINEERING
Data acquisition and experiment control, multivariable data curve fitting, computer simulation of lumped systems based on analytical and data-based models, graphical display of data and simulation results. Interactive graphics and 3-D line drawing of objects for finite element analysis. Introduction to finite element analysis and survey of other software available. Prereq: M E 749 or permission. 3 cr.

781. MATHEMATICAL METHODS IN ENGINEERING SCIENCE I
Solution of discrete and continuous systems. Review of calculus, linear algebra, complex numbers, Fourier series, differential and partial differential equations with examples from acoustics, vibration theory, hydrodynamics, elasticity, solid mechanics, transport theory, and particle mechanics. 4 cr.

782. CONTROL SYSTEMS
Fundamental principles involved in the design and analysis of feedback control systems. Topics include stability criterion, time-domain analysis, frequency-domain analysis, and introduction to nonlinear systems. (Also offered as E E 782.) Prereq: permission. Lab. 4 cr.

795. SPECIAL TOPICS IN MECHANICAL ENGINEERING
New or specialized courses and/or independent study. May be repeated for credit. 2–4 cr.

Medical Technology (MedT)

(For program description, see page 72.)

CHAIRPERSON: Karol A. LaCroix
ADJUNCT PROFESSORS: Truls Brinck-Johnsen, E. Elizabeth French, M.D.
ASSOCIATE PROFESSOR: Karol A. LaCroix
ASSISTANT PROFESSORS: Sylvia Countway, Martha Hopkins
ADJUNCT ASSISTANT PROFESSORS: Barbara Devoy, Kerry Ryan, Elizabeth Ward

401. INTRODUCTION TO MEDICAL TECHNOLOGY
Functions and responsibilities of medical technology as a unit of the health team. Lectures, films, demonstrations, and field trips. Prereq: second-semester freshman or sophomore major standing. 0 cr.

600. PATHOPHYSIOLOGY
Pathophysiology, diagnosis, and treatment of disease including disorders of the endocrine, cardiovascular, respiratory, and immunologic systems. Neoplasias and forensic medicine also discussed. 2 cr.

602. MEDICAL LABORATORY SEMINARS
Clinical case study presentations emphasizing the role of the laboratory in diagnosing and treating disease. Senior MedT majors only or by permission. 1 cr. Cr/F.

625. CLINICAL LABORATORY METHODS I
Identification and analysis of components of cellular elements of peripheral blood; hemostasis; their relationship to the body in health and disease. Introductory methods in immunohematology. Prereq: Zool 507-508 or permission. Lab. 4 cr.

626. CLINICAL LAB METHODS II
Clinical significance, performance, and evaluation of basic manual procedures for urine and plasma.

Includes macro- and microscopic analysis of urine, plasma glucose, BUN, creatinine, electrolytes, enzymes, cholesterols, bilirubins, and uric acid determinations. Prereq: Chem 403-404. Lab. 4 cr.

651. CLINICAL MICROBIOLOGY
Routine methodologies in clinical microbiology. Culture planting techniques, bacterial identifications, antibiotic sensitivity testing. Junior MedT majors only. 4 cr.

652. CLINICAL HEMATOLOGY
Routine hematological procedures, both manual and automated. Analysis of white blood cells, red blood cells, and platelets; hemostasis techniques. Junior MedT majors only. 4 cr.

653. CLINICAL IMMUNOHEMATOLOGY
Routine blood banking procedures, including blood typing, antibody screening, cross-matching, and confirmatory testing on blood units. Junior MedT majors only. 4 cr.

654. CLINICAL CHEMISTRY
Practice in the operation of automated and manual chemistry systems. Theory and laboratory analysis of routine blood chemistry components. Routine examination of the urine. Junior MedT majors only. 4 cr.

696. INDEPENDENT STUDY
In-depth studies under faculty supervision. Staff. Prereq: junior standing; approval of the major adviser and the faculty of the area concerned. 2–4 cr.

720. CLINICAL MYCOLOGY-PARASITOLOGY
Clinical laboratory identification and pathology of human mycology and parasitology infections. Classification and diagnosis of clinically significant viruses. Prereq: Micr 702. Lab. 4 cr.

751. DIAGNOSTIC MICROBIOLOGY
Advanced clinical bacteriological procedures, fluorescent techniques, and special procedures. Mycology and parasitology identification and testing. Senior MedT majors only. 4 cr.

752. ADVANCED HEMATOLOGY
Special hematology procedures including diagnostic staining, advanced hemostasis studies, and evaluation of blood cells in disease states. Senior MedT majors only. 4 cr.

753. ADVANCED IMMUNOHEMATOLOGY
Advanced blood banking procedures, including antibody identification, and component therapy. Principles and procedures for detecting disorders of cellular and humoral immunity. Senior MedT majors only. 4 cr.

754. ADVANCED CLINICAL CHEMISTRY
Theory, operation, evaluation, and maintenance of automated chemistry systems. Advanced laboratory analysis of body fluid chemistries including enzymology, isotopes, hormones, blood gases, and toxicology. Data analysis, computerization. Senior MedT majors only. 4 cr.

Microbiology (Micr)

(For program description, see page 32.)

CHAIRPERSON: Thomas G. Pistole

PROFESSORS: William R. Chesbro, Galen E. Jones, Thomas G. Pistole, Robert M. Zsigray
ASSOCIATE PROFESSOR: Richard P. Blakemore
ASSISTANT PROFESSORS: Florence E. Farber, Frank G. Rodgers

501. PUBLIC HEALTH MICROBIOLOGY
Medical microbiology with emphasis on immunology, pathogenic bacteriology, parasitology, animal virology, and the incidence and control of human communicable diseases. Coreq: Micr 502. 3 cr.

502. PUBLIC HEALTH MICROBIOLOGY LABORATORY
Laboratory techniques for identification of important pathogenic microorganisms and disease diagnosis. Coreq: Micr 501. 1 cr.

503. GENERAL MICROBIOLOGY
Principles of microbiology; morphology, physiology, genetics, culture and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Prereq: Chem 401-402 or equivalent. Lab. 5 cr.

600. ENVIRONMENTAL MICROBIOLOGY
Detection, identification, and regulation of microorganisms that enhance or deteriorate the immediate human environment. Prereq: Micr 503. Lab. 4 cr.

602. PATHOGENIC MICROBIOLOGY
Morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Discussion of clinical presentation in host and laboratory diagnoses. Prereq: gen micr. Lab. 4 cr.

701. TAXONOMY AND ECOLOGY
Isolation, identification, and classification of prokaryotic microorganisms by classical and newer techniques; analysis of the interplay between organism and environment; uses of taxonomic and ecological information. Prereq: Micr 503; Bchm 656. Lab. 4 cr.

704. MICROBIAL GENETICS
Expression and transfer of genetic elements (chromosomal and nonchromosomal) in prokaryotic and eukaryotic microorganisms; consideration of factors influencing public health, industry, the environment, and society. Prereq: Micr 503; Bchm 656. Lab. 4 cr.

705. IMMUNOLOGY
Examination of the immune response in vertebrates. Characterization of the major components of the immune system; study of host defense mechanisms and immunopathology. Serological and animal laboratory studies. Prereq: Micr 503; permission. Lab. 4 cr.

706. VIROLOGY
Principles of animal, and in selected instances, plant and bacterial virology in relation to infection and disease. Emphasis on the molecular biology of viruses, viral replication, isolation, propagation, assay, pathogenesis, diagnosis, epidemiology, and control. Virus-host interactions, especially the role of viruses in malignant transformation. Prereq: Micr 702; permission. Lab. 4 cr.

707. MARINE MICROBIOLOGY
Characterization of microorganisms in the sea in-

cluding taxonomy, physiology, and ecology; sampling, enumeration, distribution; and effects of marine environment upon microbial populations. Prereq: Micr 503 and organic chemistry. Lab. 4 cr.

708. MICROBIAL BIOGEOCHEMISTRY
Geochemical processes influenced by biochemical processes catalyzed by marine and terrestrial microorganisms; transformations of carbon, nitrogen, and other elements. Petroleum microbiology, natural gas production, sulfur formation, manganese nodules, corrosion, and fossil microorganisms. Prereq: Micr 503 and organic chemistry. Lab. 4 cr.

710. MICROBIAL CYTOLOGY AND ELECTRON MICROSCOPY
Ultrastructure and function in eukaryotes, prokaryotes, and viruses. Discussion of role of flagella, pili, cell walls, membranes, cytoplasmic inclusions, cell division, and sporulation, along with virus ultrastructure. Included are electron microscopic techniques for the study of microbial cytology; theory and uses of electron microscopes; sample preparation methods; photographic techniques and interpretation of electron micrographs. Prereq: gen micr; permission. Lab. 4 cr.

712. HOST-MICROBE INTERACTIONS
Biochemical, ultrastructural, and ecological aspects of stable host-microbe interactions, principally between prokaryotes and eukaryotes. Focus on several systems including animal digestive tracts and nutritive and luminous organs. Considerable attention also given to plant-microbe interactions, especially those involving *Rhizobium* and *Agrobacterium*. Prereq: gen micr; gen biochem; permission of instructor. Lab. 4 cr.

795, 796. PROBLEMS IN MICROBIOLOGY
Prereq: permission. 1–8 cr.

Military Science (Milt), Reserve Officers Training Corps

(For program description, see page 85.)

PROFESSOR OF MILITARY SCIENCE: Col. Richard Erickson
ASSOCIATE PROFESSOR: Lt. Col. John D. Kraus, Jr.
ASSISTANT PROFESSORS: Major Harold N. Gibbs, Major Thomas E. Taylor, Major Michael S. Kinkade, Capt. Peter Disterlic, Capt. Thomas E. Turner

413. THE DEFENSE ESTABLISHMENT AND NATIONAL SECURITY
Elements of the U.S. defense establishment and their roles in national security. Functional interrelationships: service branches, tactical maneuver elements, major commands, operating agencies, other uniformed services, and civilian agencies. The principle of civilian control. Current world events of significance to the Army officer. Leadership laboratory is strongly encouraged for cadets. 1 cr.

414. MILITARY SKILLS I
Expedient medical care, casualty processing, and cardiopulmonary resuscitation. Leadership lab is strongly encouraged for cadets. 1 cr.

501. MILITARY SKILLS II
Map reading. Land navigation techniques. Lab (required only of cadets). 1 cr.

525. AMERICAN MILITARY HISTORY
Development of American military institutions, civil-military relations, and the use of violence as an instrument of foreign policy from the colonial period to the present; battle/campaign analysis; the Army in New Hampshire. Lab (required only of cadets). 4 cr.

601. MILITARY LEADERSHIP & MANAGEMENT I
Studies in human relations, interpersonal communications, and group interaction. Authoritarian vs. participative leadership and management, motivation and self-actualization. Emphasis on interrelationship between supervision, management, and leadership, and application of theory to practice. Lab. 2 cr.

602. MILITARY LEADERSHIP & MANAGEMENT II
Further studies in human relations, interpersonal communication, and group interaction. Authoritarian vs. participative leadership and management. Emphasis on theory of training methods and functions of management. Prereq: Milt 601. Lab. 2 cr.

611. SEMINAR ON LEADERSHIP & MANAGEMENT I
Examination of combined arms team and air-land battle. Emphasis on military force coordination and planning. Professional ethics and morality in/of war also discussed. Lab. 2 cr.

612. SEMINAR ON LEADERSHIP & MANAGEMENT II
Examination of fundamentals of military law to develop students' understanding of military-specific offenses and disposition procedures. Preparation of officer candidates for post-commissioning responsibilities. Prereq: Milt 611. Lab. 2 cr.

695. OFFICER INTERNSHIP
Experiential learning through field work in a military-type unit. Written analysis required. Prereq: Milt 611 (may be taken concurrently). By permission only. May be taken up to a total of 8 credits. 1-4 cr.

Music

(For program description, see page 33.)

CHAIRPERSON: Keith Polk
PROFESSORS: Keith Polk, John E. Rogers, John D. Wicks
ASSOCIATE PROFESSORS: Ruth S. Edwards, Stanley D. Hettinger, Cleveland L. Howard, Christopher Kies, Mary H. Rasmussen, David E. Seiler, W. Niel Sir, Robert Stibler, Peggy A. Vagts, Paul F. Verrette, Henry J. Wing, Jr.
ASSISTANT PROFESSORS: Audrey Adams Havsky, Leslie J. Hunt, Roy Mann, Nicholas N. Orovich, Larry J. Veal
INSTRUCTOR: William J. Reeve

History, Literature, and Appreciation (Musi)

401. INTRODUCTION TO MUSIC
Fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective, but main emphasis is on confronting

significant works of musical art on their own terms. Some participation in musical life of the University required. Does not fulfill a major requirement. 4 cr.

402. SURVEY OF MUSIC HISTORY
Historical development of musical style in relation to the whole fabric of Western civilization. Not open to music majors. 4 cr.

501-502. HISTORY AND LITERATURE OF MUSIC
Styles, forms, and techniques of composition in Western music. Required of all music majors. 4 cr.

511. SURVEY OF MUSIC IN AMERICA
From colonial times to the present, including the various European influences, the quest for an American style, and the emergence of such indigenous phenomena as jazz. 4 cr.

513. INTRODUCTION TO THE MUSIC OF AFRICA AND ASIA
Folk and classical music of various ethnic cultures, particularly those of Japan, India, and sub-Saharan Africa. 4 cr.

581. HARMONY IN TRADITIONAL JAZZ AND POPULAR MUSIC
A practical course in the harmonization of popular songs and "blues." Typical chord progressions; their logic, extensions, and symbolic representations. Written exercises and instrumental improvization. Prereq: knowledge of notation and fundamental harmony; ability to perform on a musical instrument. Some keyboard skill highly desirable. Permission. 4 cr.

595. SPECIAL TOPICS IN MUSIC LITERATURE
Open to music majors and nonmajors; topics in areas not easily covered in historical courses. May be repeated for credit. Prereq: permission. 1-4 cr.

609. ETHNICITY IN AMERICA: THE BLACK EXPERIENCE IN THE TWENTIETH CENTURY
Team-taught course investigating music, literature, and social history of Black America in the period of the Harlem Renaissance, in the Great Depression, World War II, and in the 1960s. Special attention to the theme of accommodation with and rejection of dominant white culture. (Also offered as Engl 609 and Huma 609.) 4 cr.

701. MUSIC OF THE MEDIEVAL PERIOD
Nature of the beginnings of polyphony. The preeminent influence of the church in the 13th century and the rising secular movement in the 14th. Music as a dominant force in the political and social life of the Middle Ages. 4 cr.

703. MUSIC OF THE RENAISSANCE
Works of the 15th- and 16th-century composers from Dunstable to Palestrina. 4 cr.

705. MUSIC OF THE BAROQUE
Music of Europe from de Rore to Bach. 4 cr.

707. MUSIC OF THE CLASSICAL PERIOD
Growth of musical styles and forms from early classicism through the high classicism of Haydn, Mozart, and the young Beethoven. 4 cr.

709. MUSIC OF THE ROMANTIC PERIOD
A survey of romanticism in music from Beethoven's late period to the end of the 19th century. The works of Schubert, Berlioz, Schumann, Mendelssohn, Chopin, Wagner, Verdi, Brahms, Austrian symphonists, French pre-impressionists, and national styles in European music. 4 cr.

711. MUSIC OF THE 20TH CENTURY
Styles and techniques of composers from Debussy to the present. Special emphasis on tonal music before World War I; neoclassical trends; the emergence of atonality and serial techniques; antirationalist music; electronic music. 4 cr.

721. THE LIFE AND WORKS OF BEETHOVEN
Detailed study of Beethoven, his times, and his art as exemplified by his symphonies, piano music, chamber music, sacred music, and works for the stage. 4 cr.

732. THE ART SONG
History and literature of the solo song with piano accompaniment. Survey of national styles of the 19th and 20th centuries and deeper study of the central core of the art song—the German Lied. 4 cr.

733. SURVEY OF OPERA
History of the genre from Monteverdi to the present. Representative masterpieces by Handel, Mozart, Beethoven, Weber, Wagner, Verdi, Mussorgsky, Debussy, Berg, and others. 4 cr.

735. SURVEY OF PIANOFORTE LITERATURE
Keyboard literature from the Baroque to the present. Analysis, discussion, and illustration of works by Bach, Haydn, Mozart, Beethoven, the romantic composers, and contemporary writers. 4 cr.

795. SPECIAL STUDIES IN MUSIC
A) J.S. Bach; B) Franz Schubert; C) Debussy and Ravel; D) The World of Jazz; E) The Iconography of Western European Musical Instruments; F) 19th-Century French Music; G) Advanced Analysis; H) Advanced Study in Electronic Music; I) Composition through Computer-generated Sound; J) Woodwind Literature; K) Brass Literature; L) String Literature; M) Medieval Performance Practice; N) Renaissance Performance Practice; O) Baroque Performance Practice; P) Classical Performance Practice; Q) 19th-Century Performance Practice; R) 20th-Century Performance Practice; S) Woodwind Repair; T) String Repair; U) Advanced Jazz Improvisation; V) Advanced Piano Pedagogy; W) Advanced Accompanying; X) Advanced Conducting; Y) Independent Study. Prereq: permission. May be repeated for credit with permission. 1–4 cr.

Performance (Musi)

Registration for musical organization courses should be completed during the registration period. All music laboratory courses may be repeated. A maximum of 8 credits earned in music laboratory may be used toward graduation.

Private lessons are based on a half hour of individual instruction per week. One semester-hour credit may be earned with one lesson per week;

two or four semester hours of credit may be earned with two lessons per week (only students in the Bachelor of Music curriculum are allowed to register for four credits). Five one-hour practice periods are expected for each credit of private study. The special semester fee for lessons is $35 per half-hour lesson (this fee applies for courses numbered 541 through 550). The fee includes the use of a practice room for the required preparation.

Registration in courses of private instruction is open to all students in the University, subject to approval by the Department of Music and the instructor. Enrollment is limited in these courses. Students may register for credit in successive semesters.

441. CONCERT CHOIR—TECHNIQUES AND LITERATURE
Study and performance of classical and modern choral literature. Recommended for voice majors. Open to all students. Prereq: permission. 1 cr.

442. CHAMBER CHORUS
A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present, participates with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental work. Prereq: permission. 1 cr.

443. WOMEN'S CHORUS
Open to all students interested in singing the finest literature in this medium and who can fulfill the requirement of an audition. 1 cr.

444. THE NEWHAMPSHIREMEN
The male chorus of the University. Recommended for all male voice majors. Prereq: permission and audition. 1 cr. Cr/F.

445. SUMMER SESSION CHORUS AND BASIC CONDUCTING
Study and performance of the best classical and modern choral literature. Basic elements of choral conducting for elementary and secondary teachers, church choir directors, and those interested in singing. May be repeated. 1 cr.

448. OPERA WORKSHOP
Operatic singing, acting, and production techniques; performance of both complete operas and operatic excerpts. Prereq: permission. 1 cr.

450. SYMPHONY—TECHNIQUES AND LITERATURE
Presents several concerts during the year, of repertoire ranging from the great, standard symphonic literature to experimental, multi-media composition. Prereq: permission of conductor and audition. 1 cr.

451. UNH TRAINING ORCHESTRA
Designed for music education majors but open to all who wish to develop proficiency on major or secondary instruments. Ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for the UNH Symphony. 1 cr.

452. UNH SYMPHONIC WIND ENSEMBLE
Open to all students. Campus concerts and New England tour. Prereq: permission and audition. 1 cr.

453. UNIVERSITY BAND
Original band music, transcription, marches, etc. For students whose program does not permit music as a major interest, but who are interested in maintaining their playing proficiency and continuing their study of music. Prereq: permission 1 cr.

454. UNH MARCHING BAND
Open to all students; performs during home and away football games. Rehearsals conclude at the end of the football season. Prereq: permission. 1 cr. Cr/F.

455. PIANO ENSEMBLE—TECHNIQUES AND LITERATURE
Drawing from available student instrumentalists and singers, pianists learn the art of performing in trios, duo sonatas, and two-piano works, and gain experience in Lieder accompaniment. 1 cr.

456. STRING ENSEMBLE—TECHNIQUES AND LITERATURE

457. WOODWIND ENSEMBLE—TECHNIQUES AND LITERATURE

458. BRASS ENSEMBLE—TECHNIQUES AND LITERATURE

459. PERCUSSION ENSEMBLE—TECHNIQUES AND LITERATURE

460. JAZZ ENSEMBLE—TECHNIQUES AND LITERATURE

In these five courses, groups of instrumentalists gain experience in the performance of literature for the smaller ensemble. Prereq: permission. 1 cr.

461. VOCAL ENSEMBLE
Singers perform in small ensembles such as trios, quartets, quintets, and octets. Prereq: permission. 1 cr.

467. FUNCTIONAL PIANO
Basic instruction for music majors with no previous keyboard training. Pianoforte technique, keyboard harmony geared to the practical harmonization of simple melodies, sightreading, transposition, and modulation. May involve both class instruction and periodic short individual lessons. Prereq: permission. 1 cr.

541. VOICE

542. PIANO

543. HARPSICHORD

544. ORGAN

545. VIOLIN, VIOLA

546. VIOLONCELLO, STRING BASS

547. WOODWIND

548. BRASS

549. PERCUSSION

550. HARP (Offered by special arrangement with the department.)

551. EARLY WIND INSTRUMENTS
In courses 541 through 551 (private instruction in performance) presentation and material used vary with pupil. Emphasis on musical values and sound technique. As the student advances, repertory is broadened to include works of all periods. One solo performance each semester may be required. Prereq: permission. 1 or 2 lessons; 1, 2, or 4 cr.

751-752. CONDUCTING METHODS
Physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. Reading and analysis of full and condensed scores, study of transposition, psychology of rehearsal. Prereq: Musi 571-572 and junior standing. 2 cr.

754. COLLEGIUM MUSICUM
Instrumentalists and singers perform small ensemble music from all periods, with emphasis on Renaissance and Baroque music. Prereq: permission. 1 cr.

Theory and Composition (Musi)

411-412. FUNDAMENTALS OF MUSIC THEORY
Elements of music theory for the non-music major; principles of musical structure, analysis, elementary written counterpoint and harmony, and ear training. May not be counted for credit toward a music major. Prereq: Ability to read music and permission of instructor. 4 cr.

471-472. THEORY I
Introduction to the tonal system; principles of voice leading and harmonic progression through the analysis, realization, and composition of one-, two-, and four-voiced textures. Concept of triad inversion and consonant diatonic harmonies of the major and minor modes. Students should register for 473-474 concurrently. Prereq: permission. 3 cr.

473-474. EAR TRAINING I
Laboratory exercises to develop aural skills; sight-singing and dictation. Students should register for Musi 471-472 concurrently. Prereq: permission. 1 cr.

571-572. THEORY II
Continuation of Musi 471-472. Compositional and analytic work stresses the treatment of dissonance within the tonal system; accessory tones, seventh chords, tonicization, modulation, basic principles of chromatic harmony, and harmonization of chorale melodies are covered. Students should register for 573-574 concurrently. Prereq: Musi 472; Musi 474; permission. 3 cr.

573-574. EAR TRAINING II
Laboratory exercises to develop aural skills further. Students should register for Musi 571-572 concurrently. Prereq: Musi 472, 474; permission. 1 cr.

771-772. COUNTERPOINT
Contrapuntal techniques of tonal music. Melodic construction and dissonance treatment through work in species counterpoint and studies in harmonic elaboration and prolongation. Analysis of selected compositions emphasizes the connection between fundamental contrapuntal techniques and the voice-leading of composition. Prereq: Musi 572 or permission. 2 cr.

773. ADVANCED COUNTERPOINT
Continuation of Musi 772. Prereq: Musi 772 or permission. 2 cr.

775-776. COMPOSITION
Construction of phrases, periods, and short compositions following classical models. Problems of text-setting. Prereq: Musi 572 or permission. 3 cr.

777. ADVANCED COMPOSITION
Continuation of Musi 776. Individual compositional projects. Prereq: Musi 776 and permission. May be repeated for credit. 3 cr.

779. ORCHESTRATION
Characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students study scores, write arrangements, and have arrangements performed if at all possible. Some aspects of vocal writing. Prereq: Musi 572 or permission. 4 cr.

781, 782. ANALYSIS: FORM AND STRUCTURE
Introduction to analytical techniques through the study of representative masterworks: formal and structural elements and their interrelationships. Semester I: analysis of 18th- and 19th-century works; semester II: analysis of 20th-century works. Prereq: Musi 572 or permission. 2 cr.

785. ELECTRONIC SOUND SYNTHESIS
Part I: "traditional" or "analog" electronic sound synthesis; work with the Buchia Synthesizer in the electronic music studio. Part II: 1) elementary programming in FORTRAN, 2) the logic of computer sound syntheses, and 3) programming in MUSIC 4BF. Students will have the opportunity to run programs on a DEC KL10 computer equipped with 4-channel digital-to-analog and analog-to-digital converters. Part III: completion of a major independent study project in electronic music. Prereq: permission. 4 cr.

Music Education (MuEd)

500. EXPLORING MUSIC TEACHING
Introductory fieldwork course for students to explore music teaching as a career. Observation, teaching, research, examination of multi-mechanical aids for music curriculum development. Coreq: Educ 500. 2 cr. Cr/F.

540. BEGINNING TECHNIQUES IN VOICE
Basic techniques of voice production. Individual work is emphasized. Working knowledge of an instrument required. This course is desirable for, but not restricted to, MuEd majors. Prereq: permission. 2 cr.

545, 546. BEGINNING TECHNIQUES IN STRING INSTRUMENTS
Class and individual instruction. Four hours practice per week. Training on the violin, viola, and cello. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

595. SPECIAL PROJECTS IN MUSIC EDUCATION
Individual investigation, research, or study. Creative projects may be included. A) Marching Band Methods and Techniques. Prereq: permission. 1–4 cr.

741-742. TECHNIQUES AND METHODS IN CHORAL MUSIC
Problems in the organization and performance of high school, college, and community choruses. Techniques of choral conducting and rehearsal, repertory, and materials. 2 cr.

743. MATERIALS AND METHODS IN PIANO MUSIC
Gives potential piano teachers a coherent but flexible approach to the instruction of students of different ages and levels of talent through evaluation of methods and materials and discussion of the role of the private teacher. 2 cr.

745-746. TECHNIQUES AND METHODS IN STRING INSTRUMENTS
Class and individual instruction. Four hours of practice per week required. Intensive training on the violin, viola, cello, and double bass enables participants to perform in string ensembles. Classroom procedures, establishment of string programs, and evaluation of available methods materials. 2 cr.

747-748. TECHNIQUES AND METHODS IN WOODWIND INSTRUMENTS
Basic fundamentals of performance, class instruction, associated acoustical problems and study of woodwind literature. First semester: clarinet, flute, and saxophone. Second semester: double-reed instruments. 2 cr.

749. TECHNIQUES AND METHODS IN BRASS INSTRUMENTS
Basic course in embouchure formation, tone, tonguing, fingering, flexibility, accuracy, and range development as applied to the trumpet or baritone horn, French horn, and trombone; methods, studies, solos, and ensembles most likely to be useful with grade school, junior high school, and high school players of brass instruments. 2 cr.

751. TECHNIQUES AND METHODS IN PERCUSSION INSTRUMENTS
Basic performance skills on snare drum, timpani, mallet instruments, and other percussion instruments used in bands and orchestras. Materials and methods of instruction. 2 cr.

785. MUSIC FOR THE ELEMENTARY CLASSROOM TEACHER
Basic skills and techniques for the nonspecialist. Correlation and integration of music in the school curriculum. 4 cr.

787-788. THE TEACHING OF ELEMENTARY AND MIDDLE SCHOOL MUSIC
Aims, scope, and organization of materials and activities in elementary and middle schools. Modern trends in educational philosophy; development of the child's voice; demonstration of materials and methods for the various grades. Observation and teaching in schools. 2 cr.

791-792. THE TEACHING OF SECONDARY SCHOOL MUSIC
Educational principles applied to music teaching and learning; curriculum organization for junior and senior high school. Adolescent voice, voice classification, selection of vocal and instrumental materials, and building unified concert programs. Problems of administration; management; relationship of the teacher to school and community. Observation of secondary school music programs. 2 cr.

795. SPECIAL STUDIES IN MUSIC EDUCATION
Allows upper-level students to explore individually or in groups areas related to their specific professional interests. Prereq: permission. 1-4 cr.

796. FOUNDATIONS & PERSPECTIVES OF MUSIC EDUCATION
Examines philosophical, sociological, and psychological foundations and principles of music education and the relationship of these principles to music learning and teaching. 4 cr.

Nursing (Nurs)

(For program description, see page 73.)

CHAIRPERSON: Juliette D. Petillo
PROFESSOR: Aloise Anne Zasowska
ADJUNCT PROFESSORS: Muriel A. Poulin, Carmen R. Westwick
ASSOCIATE PROFESSORS: Ann Kelley, Juliette D. Petillo, Raelene Shippee-Rice, Rosemary Y. Wang, Carol L. Williams
ADJUNCT ASSOCIATE PROFESSOR: Marilyn P. Prouty
ASSISTANT PROFESSORS: Cynthia D. Connelly, Denise Donnell Connors, Susan B. Crowell, Margaret A. Crowley, Elizabeth Ely, James Stanley Greenleaf, Margaret A. Lamb, Dona J. Lethbridge, Leslie H. Nicoll, Linda Robinson, Margaret W. Spears, Mary Stanick, Joan J. Tomasi, Kathleen L. White
ADJUNCT ASSISTANT PROFESSORS: Marie A. Bakitas, Irene M. Bise, Virginia A. Blackmer, Judith J. Boehm, Sara Jo Brown, Janet C. Burns, William L. Burt, Patricia S. Button, Linda R. Cronenwett, Muriel C. Desrosiers, Sandra G. Dickau, Sheila A. Evjy, Shirley Girouard, Susan P. Karmeris, Virginia Kilpack, Kathryn R. Lynch, Sara K. Meade, Bridget O. Mudge, James A. Mullen, Joan P. Nickell, Doris E. Noyes, Mary Elizabeth Prendergast, Margaret A. Rice, Clare M. Stearns, Thomas J. Szopa, Suzanne Uzdavinis
ADJUNCT CLINICAL INSTRUCTORS: Mary Lou Asbell, Pamela M. Rowe

404. SUICIDOLOGY
Introductory course in the study of self-destructive behaviors and suicide: epidemiologic and demographic variables, theories of death and dying, related research. Emphasis on prevention, assessment, intervention, and postvention in suicide risk. Open to all students. 4 cr.

505. NURSING—A DEVELOPING PROFESSION
The impact of historical developments upon the present status of nursing as a profession; future of nursing as a developing profession. Through selected clinical and laboratory activities the student begins to identify with nursing as a profession. Prereq: Zool 507-508; Psyc 401; Soc 400; Engl 401; sophomore major. Coreq: Nurs 507 or current CPR certification. 2 cr.

506B. SEMINAR ON PROFESSIONAL NURSING
Health and how interactions between physical and social environments affect it. Nature and function

of health care systems and role of health professionals from historical, social, political, economic, and technical viewpoints. Individual student examination of values, attitudes, and beliefs regarding professional role and personal goals, in relation to current nursing practice. Open to EBORN students only. 6 cr.

507. CARDIOPULMONARY RESUSCITATION
Recognition of risk factors associated with cardiopulmonary arrest and development of skills in providing life support to victims. Coreq: Nurs 505 or permission of instructor. 1 cr.

510. FOUNDATIONS OF NURSING PRACTICE
Concepts and skills necessary for professional nursing practice. Interrelationships among individual, nursing, health, and environment examined in consideration of the individual's biopsychosocial needs. Through laboratory and clinical experiences, students learn to apply communication, physical assessment and basic nursing skills with individuals striving to maintain an optimal level of health. Prereq: Nurs 505; major. 4 cr.

530. THE DYNAMICS OF ADDICTION
Dynamics of addiction from the viewpoint of a disease process. Reasons for treatments and implications of addiction to drugs, alcohol, and other bodily stimuli. Cause and effect relationships involved in addiction examined from the perspectives of the individual and society. Role implications for health care providers in relation to prevention and treatment. Open to all students, sophomore and above. 4 cr.

535. DEATH AND DYING
Significance of death and dying examined from perspective of the individual, the family, the professional, and society. Discussion of theories of death and dying, and grief and grieving. Exploration of legal and ethical concerns. Open to all students. Prereq: permission. 4 cr.

550. NURSING MANAGEMENT
Provides a base for understanding the concepts, principles, and skills needed to function as a nurse manager. Content includes the following functions of nursing management: planning, organizing, staffing, influencing, and controlling. 4 cr.

595. WOMEN'S HEALTH
The course will examine women's health and women's health care from historical, political, and social perspectives. It will include discussion of societal and health care constraints that hinder women from achieving their full health potential. The course also presents information on women's health care practices, including the concept of self-care, and relates this to the development of educated consumerism in the health care system. 4 cr.

601. NURSING I
Concepts essential to the practice of nursing and awareness of the biopsychosocial needs of the individual. These concepts provide a foundation for interpreting responses to stress and the adaptive mechanisms utilized to restore wellness. Prereq: junior major. 4 cr.

601C. NURSING OF ADULTS I
Assessment of nursing care needs of selected adult clients. In clinical practice the student utilizes the nursing process to help the individual meet basic biopsychosocial needs and maintain an optimal level of health. Focus on clients undergoing surgery and clients experiencing alterations in endocrine and gastrointestinal functioning. Prereq: junior major. 4 cr.

601D. NURSING OF CHILDREN
Major health needs of children and current trends in meeting the biopsychosocial needs of the child. In clinical practice the student intervenes to meet the needs of the child and the family. Prereq: junior major. 4 cr.

601E. NURSING OF THE CHILDBEARING FAMILY
Family as focus for nursing care. Introduction to nursing care of women and their families during various phases of childbearing. Role of the nurse in assisting client and family in adaptation, thereby promoting and maintaining optimal health state and preventing or minimizing impact of illness. Influence of sociocultural patterns and legal/ethical concerns are discussed. Prereq: junior major. 4 cr.

610. NURSING II
Biopsychosocial alterations and their influence on the individual's ability to maintain an optimal level of functioning; implications for nursing practice. Prereq: junior major. 4 cr.

610C. NURSING OF ADULTS II
Increases the student's ability to make nursing decisions. In clinical practice the student will plan, implement, and evaluate care for selected adult clients experiencing physiological alterations. Prereq: junior major. 4 cr.

610D. NURSING IN THE COMMUNITY
Role of the community health nurse in health maintenance and disease prevention for the individual, family, and community. Examination of concepts of community as client and of community health status as student learns to apply nursing process to the larger population. Discussion of relationships of culture and financing to provision of health care. Students apply epidemiological model to distribution of communicable and chronic disease and analyze an epidemiological study. Consideration of major environmental issues in light of their impact on the community. Comparison of disaster philosophy and emergency care. Prereq: junior major. 4 cr.

610E. NURSING IN MENTAL HEALTH
Concepts of mental health and major biopsychosocial factors affecting human behavior. Emphasis on furthering student's understanding and skill in nurse/client interactions. Use of specific theoretical concepts guiding nurse/client interactions to assist individual to strive for an optimal level of mental health. Through a designed clinical experience, students apply mental health concepts and principles of therapeutic communication skills in the mental health setting. Prereq: junior major. 4 cr.

621. NURSING III
Analysis of nursing needs of individuals with multisystem problems. Selected case studies to emphasize the interdependence of the adaptive mechanisms of the biopsychosocial being. 4 cr.

621C. NURSING OF ADULTS III
Exploration and analysis of selected complex nursing problems in the care of ill adults. Clinical practice provides opportunity for synthesis of learning and develops ability to evaluate outcomes of nursing actions systematically. 4 cr.

629. NURSING RESEARCH
Role of nursing research in development of nursing knowledge and practice. Evaluation of nursing research reports in terms of quality and significance to nursing practice; assessment of impact of research on practice. Discussion of responsibility of the professional nurse to identify problems for research, to participate in research, and to act as advocate for the research subject. 2 cr.

630. NURSING LEADERSHIP
Leadership theories and process as they apply to nursing; leadership behaviors necessary to facilitate change. 2 cr.

630C. SENIOR PRACTICUM
Clinical experience in an area of the student's interest. Working closely with clinical preceptors and faculty, the student will integrate previously learned knowledge and skills and add to competency as a beginning professional practitioner. 4 cr. Cr/F.

632B. PROFESSIONAL NURSING: COMPETENCE ASSESSMENT
Examination and/or evaluation to determine level of competence within the seven program competence areas. Normally students will be granted from zero to the total number of credits that each competence is worth. The seven program competencies include: 1) apply knowledge of principles common to professional nursing practice to meet basic needs of individuals of all ages in all conditions in any setting; 2) relate concepts from the physical and behavioral sciences to professional nursing practice; 3) demonstrate knowledge of alterations in biopsychosocial functioning throughout the life cycle and the care appropriate to clients with those alterations; 4) apply knowledge of basic teaching-learning theory to design and implement instructional programs for individuals and groups; 5) analyze, develop, and collaborate in beginning-level nursing research in an effort to develop sound theories for nursing practice; 6) utilize the nursing process to establish therapeutic relationships in all aspects of practice in order to provide individualized, prioritized and comprehensive care to clients, families, and community groups; 7) demonstrate the ability to function independently and interdependently, applying theories of leadership and change, acting as a client advocate, and demonstrating accountability and responsibility as a professional nurse. Prereq: Nurs 506B; all nursing major prerequisites; permission. An "IA" grade (continuing course) may be given at the end of one semester. 0–48 cr. Cr/F.

635. OPERATING ROOM NURSING: NURSING PROCESS DEALING WITH SURGICAL STRESSES
Competencies necessary for professional operating room nursing. Modules include preoperative, intraoperative, and postoperative nursing care. 8-week course; 8-hour lab/week. Prereq: RN with New Hampshire licensure; or, for baccalaureate nursing students who have completed junior year, permission. 4 cr.

636. CARDIAC ARRHYTHMIAS
Theory and practice of basic single-lead arrhythmia interpretation, to provide a firm foundation of essential knowledge and procedures in the care of persons with cardiac arrhythmias. Prereq: anatomy and physiology or equivalent. Open to all students. 2 cr. (First half of semester)

637. NURSING CARE OF CLIENTS WITH CARDIAC ARRHYTHMIAS
Clinical application of nursing care to clients with cardiac arrhythmias. Prereq: Nurs 636; junior/senior nursing majors, or permission. 2 cr. (Second half of semester)

640. QUALITY ASSURANCE IN NURSING
Current trends toward quality assurance in fields of health and nursing; approaches to assessment and implementation of quality assurance programs in various practice settings. Prereq: senior major; /or permission. 4 cr.

642. INTRODUCTION TO HEALTH ASSESSMENT TECHNIQUES
Introduces the registered nurse to basic history taking and selected physical examination techniques for application in the adult health care setting. Practice will be provided under the guidance of an instructor in the laboratory setting. Learned skills will be utilized in a clinical practice setting under the guidance of an instructor. Prereq: permission. 4 cr. Cr/F.

670. ISSUES IN HEALTH CARE OF THE AGED
Current concepts and issues related to study of aging from biological and sociological perspectives. Multidisciplinary study of issues relevant to the development of social policies affecting health care and delivery of services to the elderly. Course divided into two parts: 1) study of the normal physiological and psychological processes of aging, and 2) impact of social, cultural, and economic forces on care of the elderly and delivery of health services. Open to all students. 4 cr.

690B. PROFESSIONAL NURSING PLAN OF STUDY
Open to students in the EBORN track of the nursing major. This course enables students to fulfil the terminal objectives of the nursing major that are not earned through competency assessment. Prereq: 506B. 0–48 cr. Cr/F.

695. INDEPENDENT STUDY
In-depth study with faculty supervision. Prereq: junior standing and approval of adviser and faculty of the area concerned. May be repeated for different topics. 2–4 cr.

700. SPECIAL TOPICS
Specialized courses covering information not normally presented in regular course offerings. Description of topics will vary. May be repeated but not duplicate areas of content. Prereq: permission. 4 cr. Cr/F.

Nutritional Sciences (Nutr)

(For program description, see page 47.)

COORDINATOR: Henry J. Thompson
PROFESSORS: James B. Holter, Samuel C. Smith, Henry J. Thompson
ASSOCIATE PROFESSORS: Charles Schwab, Anthony R. Tagliaferro
ASSISTANT PROFESSORS: Joanne Curran-Celentano, Colette H. Janson, Alan H. Parsons

400. FOOD AND PEOPLE
Nutrition and food science; biological, social, political, economic, and historical significance of food. Animal food products. 4 cr. (Also offered as ANSc 400.) Nonmajors only.

403. PRINCIPLES OF FOOD PREPARATION AND MEAL MANAGEMENT
Purchasing, planning, preparation, and serving of meals; management of time, money, and energy. Lab fee: $15.00. 4 cr. (Spring semester only.)

405. FOOD AND SOCIETY
Consideration of the cultural significance of food, emphasizing historical, psychological, social, political, and economic aspects. (Also offered as ANSc 405.) 4 cr.

475. NUTRITION IN HEALTH AND DISEASE
Principles of human nutrition—normal and therapeutic. Focus on source of nutrients from food, digestion, absorption, and metabolism. Discussion of: role of nutrients in maintenance of normal physiology; changes in nutrient requirements through the life cycle; and diet in the prevention and/or treatment of disease. 4 cr. (Fall semester only.)

500. INTRODUCTION TO FOOD SCIENCE
Fundamental concepts of chemistry underlying food preparation and food technology. Prereq: courses in food preparation and inorganic chemistry. Coreq: Nutr 501. 3 cr. (Spring semester only.)

501. FOOD SCIENCE LAB
Lab techniques involving food preparation and the principles of food preservation and processing. Coreq: Nutr 500. Lab fee: $10.00. 1 cr. (Spring semester only.)

504. PRINCIPLES OF INSTITUTIONAL FOOD SERVICE MANAGEMENT
Practical experience in methods of purchasing, administering, and handling food, tools, and heavy equipment used in quantity food preparation; lab experience in selective settings. Prereq: basic food preparation. 4 cr. (Fall semester only.)

605. PRINCIPLES OF NUTRITION
Principles underlying nutrition of humans and animals; digestion, absorption, intermediate metabolism, and excretion of nutrients; function of nutrients in maintenance, growth, and production; metabolic disorders resulting from inappropriate intake of nutrients and from diseases. Prereq: 1 year of chemistry; 1 semester of physiology. (Also offered as ANSc 605.) Lab. 4 cr.

699. INDEPENDENT STUDY
Scholarly project in an area of the nutritional sciences. Regular conferences with faculty adviser. May be taken only once. Prereq: permission. 2–4 cr.

700. CRITICAL ISSUES IN NUTRITION
Critical review and analysis of controversial topics in nutrition; emphasis on developing analytical reasoning skills. Prereq: permission of instructor. (Also offered as ANSc 700.) 4 cr. (Fall semester only.)

709. BIOCHEMISTRY OF NUTRITION
Intermediary metabolism of nutrients and energy; metabolism transport mechanisms; biological oxidations; interrelationships of carbohydrate, fat, and protein metabolism; obesity; control of hunger and appetite. Prereq: college course in biochemistry. (Also offered as ANSc 709.) Lab. 4 cr.

710. ANIMAL NUTRITION
Feeding and related management of farm animals with special emphasis on dairy cattle; nutrients and their use, digestive anatomy and physiology, energy systems, forage systems and quality, ration balancing (dairy, beef, sheep, poultry, swine, and equine), and selected metabolic disorders. Prereq: ANSc 605 or permission. (Also offered as ANSc 710.) 5 cr.

720. MANAGERIAL PROCESSES IN NUTRITION PROGRAMS
Focus on managerial processes of planning, leading, and evaluating nutrition programs and the skills and tools needed to develop and present such programs. (Also offered as ANSc 720.) 4 cr. (Not offered every year.)

750. HUMAN NUTRITION
Detailed analysis of the nutrient requirements throughout the life cycle. Nutrient needs are evaluated in the context of their physiological and biochemical functions. Prereq: basic nutrition. Coreq: Nutr 751. (Also offered as ANSc 750.) 4 cr. (Fall semester only.)

751, 752. PRACTICAL APPLICATIONS IN NORMAL AND THERAPEUTIC NUTRITION
Supervised practical experience in dietetics in clinical and community settings including several cooperating New Hampshire hospitals. Emphasis on patient interviewing, evaluation, counseling, and instruction; experimental techniques in anthropometric and biochemical assessment of nutritional status stressing principles of normal nutrition and changes induced by disease. Coreq for 751: Nutr 750. Coreq for 752: Nutr 774. (Also offered as ANSc 751, 752.) Lab. 3 cr.

774. CLINICAL NUTRITION
Application of principles of normal nutrition and physiology to clinical problems; altered nutrient requirements in human disease. Prereq: basic nutrition and biochemistry or permission. Coreq: Nutr 752. (Also offered as ANSc 774.) 4 cr. (Spring semester only.)

795. HONORS THESIS
A special project conducted under faculty supervision and resulting in a written honors thesis. Students must initiate discussion of the project with an appropriate faculty member. Prereq: Senior major with cumulative GPA of 3.50 (3.67 in major); permission. 4 cr.

Occupational Therapy (O T)

(For program description, see page 74.)

CHAIRPERSON: Barbara Sussenberger
ASSOCIATE PROFESSORS: Alice Crow-Seidel, Barbara Sussenberger, Ann D. Ury, Judith D. Ward
ASSISTANT PROFESSORS: Elizabeth L. Crepeau, Ruth Smith, Beth Seybold Strassler
MEDICAL LECTURERS: Luigi N. Dolcino, M.D., Susan Emerson, OTR, Kenneth O'Neil, M.D.
LEVEL II FIELDWORK COORDINATOR: Elizabeth L. Crepeau
LEVEL I FIELDWORK COORDINATOR: Alice Crow-Seidel

The following courses are for occupational therapy students; elective for others by permission of the course instructor.

400. HEALTH-HUMAN VALUES
Physiological, emotional, social, and environmental factors affecting health. Basic health information to broaden understanding of health-related issues. Students examine their patterns of decision making in issues directly affecting their lives. Also offered as SHS 400. 4 cr.

510. OCCUPATIONAL THERAPY THEORY I
Concepts and historical perspectives of the basic theories and techniques. Fundamentals of evaluation, testing, and problem solving; planning and administering treatment. Prereq: sophomore O T major. Lab. 4 cr.

512. PROBLEM SOLVING IN OCCUPATIONAL THERAPY
Using case studies, students will identify deficits in occupational performance and performance components, formulating treatment objectives and identifying activities to meet the objectives. The significance and use of activity in occupational therapy practice is explored through reading, discussion, and practical experience. Students are introduced to beginning techniques of interviewing, teaching, independent learning, and the implementation of the treatment process. Minimum lab fee: $5.00. Prereq: O T 510 or permission. 2 cr.

515. TREATMENT MEDIA ANALYSIS
Analysis of life tasks and human needs with an introduction to therapeutic analysis. Media explored for skill development and adaptation to treatment. Exposure to client population for practical application of acquired skills. Minimum laboratory fee: $12. Prereq: O T 512. Lab. 4 cr.

531. GROUP PROCESS
Dynamics and development of group relationships with emphasis on self-awareness and sensitivity to others. Comparison of normal and therapeutic groups. Group processes in practice; role development and leadership concepts. Prereq: sophomore O T major or permission. 2 cr.

581. MEDICAL CONCEPTS FOR OCCUPATIONAL THERAPISTS
Disease as a dynamic process affecting activity; medical and health models. Specific disease conditions addressed by a variety of health professionals. Prereq: Zool 507-508 or permission. 4 cr.

582. OCCUPATIONAL THERAPY THEORY II: REHABILITATION TECHNIQUES
Techniques used by occupational therapists in rehabilitation of physically disabled clients; includes practice. Prereq: PhEd 652; O T 581. 4 cr.

583. OCCUPATIONAL THERAPY: PSYCHIATRIC FOUNDATIONS
Clinical psychiatric conditions presented by a psychiatrist through patient interviews. Recognition of psychiatric symptoms, their cause, and general treatment are emphasized in follow-up sessions. Transportation fee. Prereq: Psyc 401 or permission. 4 cr.

588. LEVEL I FIELDWORK: THREE ONE-WEEK FIELDWORK EXPERIENCES
During each of the sophomore, junior, and senior years, students are required to spend one week in a clinical setting during school breaks or summers. Written evaluation is required for each. Prereq: admission to O T program; permission. 1 cr. Cr/F.

600. DEVELOPMENTAL TASKS OF ADULTHOOD
Includes the biological and psychosocial context of development. Developmental tasks as they relate to the accomplishment of prior tasks, physiological change, socioeconomic status, and psychosocial development. Prereq: Psyc 581 or permission. 4 cr.

624-624L. OCCUPATIONAL THERAPY TREATMENT OF PSYCHOSOCIAL DYSFUNCTION
Current frames of reference for occupational therapy practice in psychiatric/mental health settings. Focuses on client evaluation and treatment methods as well as an overview of program development approaches in mental health systems. Lab. Prereq: O T 531; O T 583. 4 cr.

633. TREATMENT FOR PHYSICAL DISABILITIES
Uses problem-solving model. Opportunity to acquire beginning skills in evaluation, setting of treatment goals, and selection of treatment techniques for clients with physical disabilities secondary to central nervous system dysfunction. Prereq: O T 582, PhEd 652; PhEd 606. 4 cr.

634. SYSTEMS OF THERAPEUTIC INTERVENTION IN PHYSICAL DISABILITIES
Case observation and simulation of methods of delivery of occupational therapy services and development of treatment plans for clients with physical disabilities. Prereq: O T 633; PhEd 652; PhEd 606. 4 cr.

691. SENIOR PROJECT
Offers students a structured experience through which they increase their skills in the research process related to: a) problem selection; b) problem identification; c) review of the literature; d) scholarly writing; e) critique. The course combines didactic material and experiential learning. At the outset, each student is required to identify a topic of interest from which a problem will be selected. Related learning activities will be required on a weekly basis, structured in such a way that they will provide a formative series of work leading to a final paper that meets predetermined criteria. 2 cr.

693. NEURO-DEVELOPMENTAL EVALUATION AND TREATMENT
Processes involved in treatment of neuro-developmental disabilities. With thorough understanding of normal child development as base, therapist learns to differentiate among behaviors and functional styles of clients that may be considered appropriate and anticipated, delayed, or pathological. Knowledge of unique characteristics of specific disabilities and choice of appropriate assessment tools and course of therapeutic intervention. 4 cr.

694. COMMUNITY-BASED OCCUPATIONAL THERAPY SERVICES FOR ADULTS WITH MENTAL RETARDATION
Roles and functions of the community-based therapist serving adults with mental retardation. Characteristics of the population, the environment, and related programs and agencies. Assessment and treatment approaches will be directed toward the development of community living skills to facilitate independent living. Prereq: major or permission. 4 cr.

695. INDEPENDENT STUDY
In-depth study with faculty supervision. Prereq: junior standing in O T major; approval of major adviser and faculty of area concerned. 2–4 cr.

697. TRANSITIONS: STUDENT TO PROFESSIONAL
Current professional issues related to the transition from academic to fieldwork student roles. Introduction to the knowledge and skills required for the administrative functions related to clinical practice. Content covers organization, planning, supervision, accountability, evaluation, and research. 4 cr.

711. PSYCHOSOCIAL DYSFUNCTION FIELD WORK
Supervised field experience in off-campus setting for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

712. PHYSICAL DYSFUNCTION FIELD WORK
Supervised field experience in off-campus setting for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

713. SPECIAL AREA FIELD WORK
Supervised field experience in off-campus setting for three-month period. Prereq: completion of all requirements for B.S. degree in occupational therapy. Must be completed successfully to qualify to take professional certification exam. 0 cr.

Ocean Engineering (O E)

(For program description, see page 55.)

710. OCEAN MEASUREMENTS LAB
Measurements of fundamental ocean processes and parameters. Emphasis on understanding typical offshore measurements, their applications, and the use of the acquired data, in terms of the effects on structures and processes in the ocean. 3 cr.

751. NAVAL ARCHITECTURE IN OCEAN ENGINEERING
Selected topics in the fundamentals of naval architecture pertinent to ocean engineering, including hydrostatic characteristics, basics of resistance and propulsion and rules and regulations for surface, semisubmersible, and submersible marine vehicles. Computer applications. Prereq: M E 508; M E 525;/or permission. (Also offered as M E 751.) 4 cr.

752. SUBMERSIBLE VEHICLE SYSTEMS DESIGN
Conceptual and preliminary design of submersible vehicle systems; submersibles, environmental factors, hydromechanic and structural principles, materials, intra/extravehicle systems, operating considerations, predesign and design procedures. Design projects selected and completed by student teams. Prereq: permission. (Also offered as M E 752). 4 cr.

753. OCEAN HYDRODYNAMICS
Fundamental concepts of fluid mechanics as applied to the ocean; continuity; Euler and Navier-Stokes equations; Bernoulli equation; stream function, potential function; momentum theorem; turbulence and boundary layers are developed with ocean applications. Prereq: permission. 3 cr.

754. OCEAN WAVES
Introduction to water waves; linear small amplitude wave theories; finite amplitude wave theories; long wave theory; wave motion as a random process; interaction of waves with structures; similitude and scale model technology. Prereq: permission. 3 cr.

757. COASTAL ENGINEERING AND PROCESSES
Introduction to small amplitude and finite amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. (Also offered as Ci E 757; M E 757.) Prereq: fluid dynamics or permission. 3 cr.

761. MATERIALS IN THE OCEAN
Introduction to mechanical properties of materials; ferrous metals; non-ferrous metals; concrete, plastic, wood, etc.; corrosion of metals; corrosion control; durability of cementitious materials; degradation of plastics, wood, etc. in marine environment; proper materials selection for a marine environment. Prereq: permission. 3 cr.

781. PHYSICAL INSTRUMENTATION
Analysis and design of instrumentation systems. Sensors, circuits, and devices for measurement and control. Elements of probability and statistics as applied to instrument design and data analysis. Transmission, display, storage, and processing of information. 4 cr.

785. UNDERWATER ACOUSTICS
Vibrations; propagation; reflection; scattering; reverberation; attenuation; sonar systems; ray and mode theory; transducers and arrays; signal analysis. Prereq: permission. 4 cr.

795. SPECIAL TOPICS IN OCEAN ENGINEERING
New or specialized courses and/or independent study. May be repeated for credit. 2–4 cr.

Oceanography

(For program description, see page 55.)

Philosophy (Phil)

(For program description, see page 33.)

CHAIRPERSON: Yutaka Yamamoto
PROFESSORS: Paul T. Brockelman, Asher Moore, Duane H. Whittier
ASSOCIATE PROFESSORS: R. Valentine Dusek, Neil B. Lubow, Robert C. Scharff, Barbara S. Tovey, Yutaka Yamamoto
ASSISTANT PROFESSORS: Andrew Christie, Timm A. Triplett

Introduction to Philosophy: The 400-level courses (except 495) listed below are all introductions to philosophy; students should select among them according to interest.

401. GENERAL INTRODUCTION TO PHILOSOPHY
Depending upon the instructor, the emphasis will be on basic philosophic problems, recurrent types of philosophies, or selected readings from the history of philosophy. 4 cr.

412. BEGINNING LOGIC
Principles of reasoning and development of symbolic techniques for evaluating deductive and inductive arguments. Not open to junior and senior students in E E, C S, and Math; it is recommended that these students take Phil 550. 4 cr.

417. PHILOSOPHICAL REFLECTIONS ON RELIGION
Introductory philosophy of religion. To help students become critically aware of philosophical issues involved in various forms of religious belief and some of the persisting philosophical understandings of those issues. 4 cr.

421. PHILOSOPHY AND THE ARTS
Contemporary philosophic concerns and perspectives as reflected in one or more of the arts (literature, theater, film, music, plastic art). 4 cr.

424. SCIENCE, TECHNOLOGY, AND SOCIETY
Consideration of the scientific endeavor and its social import from a philosophical perspective. 4 cr.

430. SOCIETY AND MORALS
Critical study of principles and arguments advanced in discussion of current moral and social issues. Possible topics: violence, rules of warfare, sexual morality, human rights, punishment, abortion. 4 cr.

435. THE HUMAN ANIMAL
Philosophy of biology and the evolutionary process. Readings of scientists and philosophers' commentary on scientists. Examination of the differences between scientific debate and philosophic debate. Philosophical study of scientific theory stressing humans' place in the natural world and the ethical implication of humans as natural beings in the evolutionary process. 4 cr.

436. SOCIAL AND POLITICAL PHILOSOPHY
Important concepts in social and political philosophy such as natural rights, revolution, law, freedom, justice. Variable content. 4 cr.

447. COMPUTER POWER AND HUMAN REASON
The historical origins of the science of computation. The implications of the nature of information-processing for understanding the mind-body relation. Examination of the possible social, economic, and educational consequences of the computer revolution. 4 cr.

475. PHILOSOPHICAL REFLECTIONS ON EDUCATION
Philosophical study of the nature, significance, and place of education within the human condition. Students begin to work out and articulate their own attitudes toward the basic issues which lie at the heart of education at all levels. 4 cr.

495. TUTORIAL READING
Basic introductory reading under faculty direction on topics of philosophical importance. Books offered for tutorial reading may be in any area the instructor chooses or on an independent study basis. Prereq: permission. Variable to 4 cr.

496. PHILOSOPHIC TOPICS
Introductory-level seminar in specific topics or problems (e.g., death, love, friendship) considered from a philosophic point of view. 4 cr.

For special introductory courses in the area of applied philosophy, see Fundamentals of Applied Philosophy, page 174.

520. INTRODUCTION TO EASTERN PHILOSOPHY
Major Eastern traditions of philosophy. Concentration on Indian, Chinese, and Japanese systems may vary from semester to semester. 4 cr.

530. MORAL PHILOSOPHY
Critical examination of the development of philosophical thinking regarding human values, rights, and duties. 4 cr.

550. LOGIC
Principles and techniques of modern logic. Topics: propositional logic, truth tables, predicate logic, and, time permitting, basic metatheorems. Phil 412 is recommended for students without a sound high school mathematics background. 4 cr.

570. ANCIENT PHILOSOPHY
Development of Western philosophy from its beginnings in Greece to the Roman period, with particular emphasis on the thought of Plato and Aristotle. 4 cr.

571. MEDIEVAL PHILOSOPHY
Philosophical thought of the Middle Ages from inception in the late Roman period with thinkers such as Plotinus and Augustine through the late Medieval speculative mysticism of such figures as Meister Eckhart. Writings of Augustine and Thomas Aquinas. 4 cr.

572. MODERN PHILOSOPHY: RATIONALISM
Continental European philosophers of the 17th and 18th centuries including Descartes, Leibniz, Spinoza, and Kant. 4 cr.

573. MODERN PHILOSOPHY: EMPIRICISM
British empiricists of the 17th and 18th centuries; e.g., Locke, Berkeley, and Hume; perhaps concluding with Kant's reaction to empiricism. 4 cr.

577. 19TH-CENTURY PHILOSOPHY
Philosophical movements such as later German idealism, French positivism, utilitarianism, pragmatism, Marxism, existentialism, and vitalism. Prereq: Phil 572 or 573; /or permission. 4 cr.

600. PHILOSOPHY THROUGH LITERATURE
Philosophical implications of representative literary works; content variable. 4 cr.

618. RECENT ANGLO-AMERICAN PHILOSOPHY
Philosophical movements such as analytic philosophy, pragmatism, and process philosophy. Typical readings: Russell, Wittgenstein, James, Dewey, Whitehead. Prereq: two courses in history of philosophy (one of which may be concurrent); /or permission. 4 cr.

620. RECENT EUROPEAN PHILOSOPHY
Major developments and themes. Representative figures: Jaspers, Husserl, Heidegger, Bloch, Lukacs, Habermas, Bergson, Marcel, Sartre, Merleau-Ponty, Ricoeur, Kolakowski, etc. Prereq: two courses in history of philosophy (one of which may be concurrent); /or permission. 4 cr.

630. PHILOSOPHY OF THE NATURAL SCIENCES
Philosophical problems raised by the physical and biological sciences; role of mathematics in science, nature of scientific concepts of space and time, relations of science to common sense, relation of theory to observation, logic of scientific discovery, nature of historical changes in scientific worldview, relation of logic of science to the psychology and history of science. 4 cr.

635. PHILOSOPHY OF LAW
Systematic study of salient features of legal systems. Possible topics: nature of law; concept of legal validity; law and morality; individual liberty and the law; legal punishment; legal responsibility and related concepts (for example, legal cause, harm, *mens rea*, negligence, strict liability, legal insanity). 4 cr.

640. KANT AND HEGEL
Prereq: two courses in history of philosophy; /or permission. 4 cr.

650. LOGIC: SCOPE AND LIMITS
Close examination of the scope and limits of formal systems. Variable content: consistency and completeness of predicate logic; Gödel's proof and the formalization of mathematics; modal and deontic logic; set theory; finite automata and computing machines; and formal semantics. Prereq: Phil 550; Math 531;/equivalents or permission. 4 cr.

690. INTERDISCIPLINARY STUDIES
Interdisciplinary studies of philosophical issues arising in one or more areas of specialization outside the department. 4 cr.

699. SENIOR THESIS
Tutorial work for philosophy department candidates for "Commendation" and "Honors." Prereq: two courses in history of philosophy, senior standing, and permission. 4 cr. Cr/F.

701. TOPICS IN VALUE THEORY
Philosophical inquiry into the nature of value. Topics may include: The grounds of right and wrong; various conceptions of morality; the nature of good and evil; theories about the meaning of life; the nature of the beautiful. Prereq: permission. 4 cr.

702. TOPICS IN METAPHYSICS AND EPISTEMOLOGY
Advanced study in one or more of the following topics: nature of reality; relationship of thought and reality; nature of knowledge and perception; theories of truth. Prereq: two courses in history of philosophy; /or permission. 4 cr.

710. PHILOSOPHY OF RELIGION
Philosophic nature and significance of religious experience; historical and systematic analysis of such traditional issues as the nature of faith, relation of faith to reason, arguments concerning the existence and nature of God, the problem of evil, the relationship of religion and morality, and the relationship of religion and science. Prereq: two courses in history of philosophy; /or permission. 4 cr.

720. PHILOSOPHICAL PSYCHOLOGY
Philosophical perspectives and problems concerning human nature or the human condition; e.g., the nature of "self," human action, the body-mind problem, freedom of the will, the meaning of "person," the nature of behavior, etc. Prereq: two courses in history of philosophy; /or permission. 4 cr.

725. PHILOSOPHY OF THE SOCIAL SCIENCES
Nature of explanation and understanding in the social sciences. Similarities and differences between the social and physical sciences; claims of objectivity and of subjectivity in the social sciences; role of values in the social sciences. Prereq: two courses in history of philosophy; /or permission. 4 cr.

745. PHILOSOPHY OF LANGUAGE
Contemporary philosophical studies of the nature of meaning and structure of language. Prereq: two courses in history of philosophy; /or permission. 4 cr.

750. PHILOSOPHY OF HISTORY
Nature of historical knowledge, efforts to discover patterns of meaning in the past. Prereq: two courses in history of philosophy; /or permission. 4 cr.

780. SPECIAL TOPICS IN PHILOSOPHY
Advanced study of special topics: e.g., a problem, figure, or movement in the history of philosophy; or selected issues, thinkers, or developments in contemporary philosophy. Prereq: two courses in history of philosophy; /or permission. 4 cr.

795, 796. INDEPENDENT STUDY
For students who are adequately prepared to do independent, advanced philosophical work; extensive reading and writing. Before registering, student must formulate a project and secure the consent of a department member who will supervise the work. Conferences and/or written work as required by the supervisor. 1–4 cr.

Fundamentals of Applied Philosophy

The following are introductory courses on the fundamentals of philosophy in practice. Special em-

phasis is placed on identifying and reflecting on philosophical issues that arise in the context of one's professional as well as everyday life. They are designed to interest those who wish to examine the broader philosophical implications of their chosen professional activity and also those who share the awareness that, in today's world, a systematic value-orientation must complement one's scientific knowledge and skills.

447. COMPUTER POWER AND HUMAN REASON
(For program description, see page 173.)

660. LAW, MEDICINE, AND MORALS
Critical examination of the diverse legal and moral issues facing the profession of health care. Variable topics. Possible topics: duty to provide care; nature of informed consent to treatment; problems of allocating limited health care resources (e.g., withdrawal of life-support systems, quality-of-life decisions, etc.); patient's right to confidentiality; problems relating to involuntary preventive care (e.g., involuntary sterilization, psycho-surgery, etc.). 4 cr.

683. TECHNOLOGY: PHILOSOPHICAL AND ETHICAL ISSUES
The bases of modern technology in, and its impact upon, people's philosophic conceptions of themselves and their world. Ethical, social, political, and ecological implications of technology. Risk and benefit criteria. Technological and humanistic philosophies of life. 4 cr.

Physical Education (PhEd)

(For program description, see page 75.)

CHAIRPERSON: Walter E. Weiland
ASSOCIATE PROFESSORS: Katherine Amsden, Gavin H. Carter, Phyllis A. Hoff, Robert Kertzer, D. Allan Waterfield, Robert E. Wear, Walter E. Weiland
ASSISTANT PROFESSORS: Thomas R. Barstow, James L. DePaepe, B. Joyce Mills, Nancy C. Rupp, Neil B. Vroman
INSTRUCTOR: Michael A. Gass
LECTURER: Frank C. Helies, Jr.

FACULTY FROM THE DEPARTMENTS OF INTERCOLLEGIATE ATHLETICS
ASSISTANT PROFESSORS: Lionel J. Carbonneau, Theodore W. Conner
LECTURERS: James H. Boulanger, M. William Bowes, Edmund Datti, Cecelia DeMarco, Marisa Didio, Gerald J. Friel, Richard F. Garber, Jr., Gail A. Goodspeed, Nancy L. Krueger, Kelsy Kuehn, Robin E. Meeks, Carol E. Rowe, Alexander Scourby, James H. Urquhart

The Major Program

Prospective physical education majors should refer to page 75 for information regarding the major programs.

The Elective Program

The Department of Physical Education provides an opportunity for students to participate in an elective activity program in a wide variety of sports, aquatics, conditioning, gymnastics, and outdoor education courses. Courses offered are listed below under Elective Physical Education Activities.

The department supplies special uniforms. Students are required to furnish such items as sneakers. Fees are charged for off-campus activities such as backpacking, ice climbing, rock climbing, and skiing. Students with physical limitations are encouraged to participate in the program on a modified basis. PhEd 410-468 may be repeated once for credit.

Elective Physical Education Activities

410-468. ELECTIVE PHYSICAL EDUCATION
Activity coursework open to all undergraduates. Cr/F.

Half-Semester Courses (.5 credits each)

410. ARCHERY

411. FIGURE SKATING—BEGINNING

412. FIGURE SKATING—ELEMENTARY/INTERMEDIATE

413. BICYCLING

414. BASIC SKATING

415. GOLF—BEGINNING

416. GOLF—INTERMEDIATE

417. ICE HOCKEY

418. SKI CONDITIONING

420. SKIING—BEGINNING*

421. SKIING—INTERMEDIATE*

422. SKIING—ADVANCED*

423. SKIING—RACING*

424. SKI TOURING—BEGINNING

425. TENNIS—BEGINNING

427. TENNIS—INTERMEDIATE

428. TENNIS—ADVANCED

429. SPECIAL TOPIC

431. SQUASH

432. SKI TOURING—INTERMEDIATE

433. RACQUETBALL—BEGINNING

434. RACQUETBALL—INTERMEDIATE

435. BADMINTON

* Gunstock

443. OUTDOOR EDUCATION

461. BASIC SAILING

462. BASIC CANOEING

463. BASIC ROCK CLIMBING

Half-Semester Courses (1 credit each)

464. INTERMEDIATE ROCK CLIMBING

465. BASIC ICE CLIMBING

466. BASIC BACKPACKING

467. INTERMEDIATE BACKPACKING

468. WINTER WILDERNESS BACKPACKING

Full-Semester Courses (1 credit each)

437. COURT GAMES (RACQUETBALL, SQUASH)

438. FENCING—BEGINNING

439. FENCING—INTERMEDIATE

440. FIGURE CONTROL

441. GYMNASTICS

442. HIKING/ORIENTEERING

447. ADVANCED LIFESAVING

448. SWIMMING—BASIC

451. VOLLEYBALL

452. WEIGHT TRAINING

453. BEGINNING YOGA

454. SPECIAL TOPIC

456. INTERMEDIATE YOGA

457. AEROBIC ACTIVITIES

Activities for Physical Education Majors

470-492. MAJOR ACTIVITY COURSEWORK
Performance skills and beginning teaching methods.

470. GYMNASTICS 1 cr.

471. OUTDOOR ADVENTURE ACTIVITIES 1 cr.

472. EDUCATIONAL GYMNASTICS 1 cr.
Gymnastics in movement education emphasizing the problem-solving method of teaching.

473. TRACK AND FIELD 1 cr.

474. FOLK, SQUARE, AND SOCIAL DANCE .5 cr.

475. CONDITIONING 1 cr.

476. VOLLEYBALL .5 cr.

477. TENNIS .5 cr.

478. LEAD-UP GAMES .5 cr.

479. ACTIVITIES FOR ELEMENTARY SCHOOL .5 cr.

482. MEN'S LACROSSE .5 cr.

484. SOFTBALL .5 cr.

486. WOMEN'S LACROSSE .5 cr.

487. FIELD HOCKEY .5 cr.

490. BASKETBALL .5 cr.

492. SOCCER .5 cr.

Theory Courses

500. PERSPECTIVES IN PHYSICAL EDUCATION
An introduction to the profession of physical education, including concentrations on the historical, sociological, and adapted perspectives. 4 cr.

501. ADVANCED FIRST AID AND EMERGENCY CARE
American National Red Cross program in advanced first aid and emergency care. (May not repeat for credit.) 2 cr. Cr/F.

502. BASIC ATHLETIC TRAINING
Etiology, pathology, acute care, and prognosis of sports injuries. Lab. 4 cr.

503. ATHLETIC TRAINING APPLIED TECHNIQUES
Theory and lab in preventive and safety techniques including taping, wrapping, and padding. This course is designed to fulfill clinical skill competencies proposed by the NATA. 2 cr.

520. WATER SAFETY INSTRUCTORS' COURSE
Analysis of aquatic techniques; methods of teaching swimming, diving, and lifesaving. A.R.C. instructor certification awarded to candidates with high caliber of personal skill, knowledge, and teaching ability. Prereq: current A.R.C. advanced lifesaving certificate. 2 cr.

521. THEORY OF COACHING BASKETBALL
Individual and team offense and defense; rules of the game. Problems in team handling and conditioning. Prereq: permission. 2 cr.

522. THEORY OF COACHING FOOTBALL
Systems of play; team and individual offensive and defensive fundamentals; theory and strategy of team play; coaching methods, physical conditioning; rules. 2 cr.

523. THEORY OF COACHING HOCKEY
Basic hockey skills. Fundamentals of individual and team offense and defense; coaching methods; rules. 2 cr.

524. THEORY OF COACHING BASEBALL
Batting and fielding; fundamentals of each position; problems of team play; coaching methods; physical conditioning; rules. Prereq: permission. 2 cr.

525. THEORY OF COACHING SOCCER
Fundamental and advanced skills and techniques; offensive and defensive principles of team play; tactical formations and strategy; methods of training and practicing; rules. Prereq: permission. 2 cr.

526. THEORY OF COACHING WRESTLING
Theory, practical teaching methods, and the development of skills and techniques from basic maneuvers to the more advanced. 2 cr.

527. AQUATIC LEADERSHIP TRAINING
Methods, organization, and administration of A.R.C. and YMCA aquatic programs. Methods of teaching swimming, diving, and lifesaving; program planning; officiating; operation and maintenance of swimming pools; camp waterfront; health and safety aspects of aquatic programs; legal problems; skin and Scuba diving; drownproofing. Students may obtain WSI certification. Prereq: current A.R.C. advanced lifesaving certificate. 2 cr.

528. THEORY OF COACHING TRACK AND FIELD
Starting, sprinting, middle-distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin. Methods of training and practicing. Prereq: PhEd 473. 2 cr.

529. THEORY OF COACHING GYMNASTICS
Theory, practical teaching methods, and officiating. Construction of gymnastic routines, from elementary to international level. Prereq: PhEd 470 or permission. 2 cr.

530. THEORY OF COACHING SWIMMING AND DIVING
Philosophy, historical development, and psychological theories of coaching. Mechanical and kinesiological aspects of the competitive strokes and required optional dives, low and high board. 2 cr.

531. THEORY OF COACHING FIELD HOCKEY
Analysis of field hockey coaching techniques. New systems of play; use of interval training for preseason conditioning and inseason practices. Prereq: PhEd 487 or permission. 2 cr.

532. THEORY OF COACHING RACQUET SPORTS
Thorough and indepth knowledge of the administration and coaching of major racquet sports: badminton, racquetball, squash, and tennis. Prereq: permission. 2 cr.

533. BASIC SCUBA
Pool and classroom instruction in scuba fundamentals, N.A.U.I. certification for successful completion of course and 3 open water dives. Strong swimming ability required. $45 fee. 2 cr.

548. HIGH ALTITUDE MOUNTAINEERING
Knowledge, skills, and attitudes of mountaineering at high altitudes. Focus on techniques used when leading adventure experiences with groups for extended periods of time and distances. Prereq: permission; previous backpacking and climbing experience. 2 cr. Cr/F.

549. ROPES COURSE MANAGEMENT
Management of ropes courses as an educational and therapeutic medium with a variety of populations. Focus on initiatives, construction of high and low ropes course elements, and variety of evaluation techniques used with ropes courses. Prereq: PhEd 463 or permission. Fee: $20. 2 cr.

550. OUTDOOR EDUCATION PHILOSOPHY AND METHODS
The rationale and basic structure of effective teaching techniques and procedures for outdoor education; uses an interdisciplinary approach; 3 lecture hours and field experience required. 4 cr.

552. CAMP LEADERSHIP COURSE
An introductory course for training future leaders in areas of camp counseling and outdoor living skills in a variety of settings and programs; 3 lecture hours and lab/field experiences. 4 cr.

563. THE THEORY OF TEACHING PHYSICAL EDUCATION IN THE SECONDARY SCHOOL
Teaching methods. Lab. Prereq: minimum of 6 credits from coursework numbered PhEd 470-492; Educ 500. 4 cr.

606. NEUROLOGY
Morphology, physiology, and histology of the human nervous system. Lab. Prereq: Zool 507-508. 4 cr.

610. ADAPTED PHYSICAL EDUCATION
Common disorders of handicapped children; practical experience in the remediation of those disorders through the use of adapted physical education activities. Lab. Prereq: Zool 507-508. 4 cr.

620. PHYSIOLOGY OF EXERCISE
Acute and chronic effects of exercise. Muscle physiology, respiration, cardiac function, circulation, energy metabolism, and application to training. Prereq: Zool 507-508. 4 cr.

621. EXERCISE LABORATORY TECHNIQUES
Administration of graded exercise tests on treadmill, bicycle ergometer, and stepping bench. Monitoring physiological variables during the graded exercise test. Calculation of metabolic data resulting from the exercise test. Prereq: PhEd 620. 3 cr.

625. DYNAMICS OF HUMAN MOVEMENT
Kinesiological consideration of factors which affect efficiency. Cinematographic and non-cinematographic forms of analysis of selected movement events and sequences. Prereq: Zool 507-508. (Not open to students who have taken PhEd 652). Lab. 4 cr.

635. SPORT IN LITERATURE
Survey of sport as it is recorded in literature, both classical and contemporary, and the effect of sport on writing. 4 cr.

636. INTRODUCTION TO SPORTS INFORMATION
Basic concepts of sports information related to preparation of material for public relations including radio, television, and publications. Includes guest lecturers and work in the UNH Sports Information Office. 2 cr.

650. EXERCISE SPECIALIST INTERNSHIP
A one-semester internship in an agency that offers physical activity programs of prevention, intervention, and rehabilitation. Activities include graded exercise testing, exercise prescription, and exercise session leadership. Prereq: open only to students who are enrolled in the exercise specialist option and have completed all requirements for the option. 8 cr. Cr/F.

652. CLINICAL KINESIOLOGY
The science of human motion. Human muscular anatomy; actions of skeletal muscles using electromyographic evidence. Applications of concepts of muscle physiology and biomechanics to physical education activities. Lab. Prereq: Zool 507-508. (Not open to students who have taken PhEd 625.) 4 cr.

668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION
Essential elementary statistical methods; measurement data scientifically evaluated for application to the program. Lab. 4 cr.

675. MOTOR DEVELOPMENT OF THE YOUNG CHILD
Characteristics of motor behavior across time, and the role of movement in a child's total development. Growth processes, analysis of movement, variations in movement due to maturation, environment, and experiences. Prereq: PhEd 472 or permission. Lab. 4 cr.

681. THEORY OF ADVENTURE EDUCATION
Basic skills and theories necessary in developing adventure education activities. Prereq: 2 outdoor adventure activity classes and permission. 3 hours of lecture and field experience. 4 cr.

682. OUTDOOR LEADERSHIP
Provides students with leadership experience and new skills in vigorous environments. Students must have previous outdoor skill experience. Three class hours per week plus two weekend field experiences. Offered both semesters—may be taken once in each semester. 2 cr.

683. ORGANIZATION AND ADMINISTRATION OF OUTDOOR EDUCATION
Study of the administration of outdoor education programs using a variety of organizational models. Students will develop a program and, through simulated exercises, manage their program. Field experience. Prereq: PhEd 550; junior standing. 4 cr.

684. EMERGENCY MEDICAL TECHNICIAN TRAINING
Standard course in EMT training that will fulfill the number of hours required by the state of New Hampshire and national certifying EMT boards and prepare the student for the National Registry Examination. Lab. Prereq: permission; advanced first aid. Fee. 3 cr. Cr/F.

692. THEORIES OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL
Current theories and methods; consideration given to growth and developmental needs in curriculum planning. Prereq: 6 credits from PhEd 470-492; Educ 500; PhEd 675. Lab. 4 cr.

693. TEACHING ASSISTANTSHIP
A) Teacher Preparation; B) Exercise Leader; C) Outdoor Education; D) Science Labs; E) Cardiac Rehabilitation. Students serve as teaching assistants in assigned class activities. Assignments to be made by the class instructor may include teaching assistants' and administrative duties. May take two different sections. Prereq: junior standing; permission of adviser and instructor. (max. 4 cr.) 2 cr. Cr/F.

694. INTERNSHIP
A) Outdoor Education; B) Teacher Preparation; C) Sports Communication. Students may apply for credit for internship experiences that are directly related to their option. Internships may be on or off campus. Prereq: PhEd major; min. 64 accum. cr.; permission of adviser and department chairperson. (max. 4 cr.) 2–4 cr. Cr/F.

696. INDEPENDENT STUDY
In-depth study. Prereq: PhEd major with junior standing and approval of academic adviser and department chairperson. 2–4 cr. to a maximum of 4 cr.

700. APPLIED STATISTICS
Statistical procedures and associated elements of basic research design with direct, practical application to areas within physical education and other health disciplines. Prereq: PhEd 668 or equivalent. 4 cr.

702. ADVANCED ATHLETIC TRAINING
Assessment, rehabilitative treatment, preventive strapping, and protective equipment used in athletic training. Administration of a training room facility. Lab. Prereq: PhEd 502. 4 cr.

703. LABORATORY PRACTICE IN ATHLETIC TRAINING
150 hours of experience in UNH athletic training room under N.A.T.A. certified trainer. Prereq: PhEd 502. May be repeated up to 8 cr. 2 cr.

710. UNDERWATER RESEARCH METHODS
Lecture, open water, and pool instruction in underwater research techniques and hyperbaric physiology lab. Prereq: basic scuba certification and permission. Fee. 4 cr.

722. GRADED EXERCISE TESTING AND EXERCISE PRESCRIPTION
Graded exercise testing and its application to the prescription of exercise. Special emphasis on the patient with cardiovascular disease. Prereq: PhEd 620. 4 cr.

732. ELECTROCARDIOGRAPHY
An introduction to the reading and assessment of EKGs. Prereq: PhEd 620 or equivalent. 4 cr.

733. ENVIRONMENTAL PHYSIOLOGY
The human physiological response to both the acute and chronic effects of various environmental conditions, such as heat, cold, altitude, and air pollution. Prereq: PhEd 620 or permission. 4 cr.

740. PERCEPTUAL MOTOR DYSFUNCTION
Theoretical rationale and clinical perceptual-motor training programs of Ayres, Kephart, Cratty, Barsch, and Getman, as they relate to sensory-motor integration and the remediation of learning disabilities. Prereq: PhEd 775, or permission. 4 cr.

741. SPORT IN SOCIETY
Investigation of interrelationships among sport, culture, and society in an attempt to understand better the role and function of sport in contemporary society. Overview of selected sociocultural factors that influence and result from participation in sports. Prereq: Soc 400 or permission. 4 cr.

750. ANALYZING TEACHING IN PHYSICAL EDUCATION
Examination of teaching practices, theories, and research implications. Varied approaches to the study and improvement of teaching, including analysis of films and tapes. Prereq: PhEd 563 or 692 or permission. 4 cr.

760. APPLICATION OF RESEARCH TO TEACHING AND COACHING
Pertinent research findings in sport psychology, sport sociology, exercise physiology, biomechanics and kinesiology, and motor learning and development. Prereq: PhEd 668 or equivalent; permission. 4 cr.

775. PERCEPTUAL MOTOR LEARNING
Variables affecting the learning and performance of skilled activity; ability and motivational characteristics of the learner; processes for skill acquisition. Prereq: Psyc 401. Lab. 4 cr.

780. PSYCHOLOGICAL FACTORS IN SPORT
Factors of outstanding athletic achievement; psychological variables in competition; the actions and interactions of sport, spectator, and athlete. Prereq: Psyc 401 or PhEd 775. 4 cr.

791. HISTORY OF PHYSICAL EDUCATION
From ancient Egypt to modern times. Influences of Greece, Rome, the Renaissance and Reformation periods, and modern European nationalism. Analysis of events and the beliefs of leaders in the development of systems of physical education. 4 cr.

795. SPECIAL TOPICS
New or specialized courses not normally covered in regular course offerings. Prereq: permission. May be repeated up to 8 cr. 2–4 cr.

Physics (Phys)

(For program description, see page 67.)

CHAIRPERSON: Harvey K. Shepard
PROFESSORS: Roger L. Arnoldy, L. Christian Balling, John R. Calarco, Edward L. Chupp, John F. Dawson, Lennard A. Fisk, Jr., Jochen Heisenberg, Robert E. Houston, Jr., Richard L. Kaufmann, Robert H. Lambert, John A. Lockwood, Lyman Mower, John E. Mulhern, Jr., Harvey K. Shepard, William R. Webber, John J. Wright
RESEARCH PROFESSOR: Joseph Hollweg
ASSOCIATE PROFESSOR: Robert E. Simpson
RESEARCH ASSOCIATE PROFESSORS: David J. Forrest, Martin A. Lee
ASSISTANT PROFESSOR: F. William Hersman
RESEARCH ASSISTANT PROFESSOR: James M. Ryan

401-402. INTRODUCTION TO PHYSICS I AND II
Broad survey of classical and modern physics. Designed to enable students to appreciate the role of physics in today's society and technology. Emphasis on the fundamental laws of nature on which all science is based, with some examples of interest to biologists. Knowledge of high school algebra and trigonometric functions essential. Lab. 4 cr.

405. CONCEPTS OF PHYSICS
Descriptive course investigating a limited number of important physical systems. Emphasis on how the system is to be investigated and the patterns in which the results fall. Intuitive concepts used in investigations traced into their application in modern physics. Patterns of thought in physics related to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. 4 cr.

406. INTRODUCTION TO MODERN ASTRONOMY
Descriptive coverage of contemporary astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the universe. Recommended for liberal arts and beginning science students. Knowledge of high school algebra is assumed. Lab. 4 cr.

407-408. GENERAL PHYSICS I AND II
Introductory course emphasizing mechanics and electromagnetism. Recommended for the student specializing in science and engineering. Prereq: thorough knowledge of algebra and trigonometry; Math 425 for 407, and Math 426 for 408, or taken concurrently. Students may not receive credit for both 401 and 407 (or 402 and 408). Lab. 4 cr.

411. HOUSEHOLD PHYSICS
Practical, nonmathematical introduction to the physical principles necessary to understand how and why common devices work. Emphasis is on household appliances and automobiles. Classroom demonstrations and laboratories to illustrate theories and practical applications. Prereq: permission. Students may receive credit for either 411 or 412, but not both. 4 cr.

412. TECHNICAL PHYSICS
An introductory course in physics emphasizing the fundamentals of mechanics, heat, electricity, and other subjects underlying modern machinery and instruments. Recommended for Thompson School students. Prereq: algebra, trigonometry; permission. Students may receive credit for either 411 or 412, but not both. Lab. 4 cr.

505. GENERAL PHYSICS III
Fluid dynamics, thermodynamics, kinetic theory, optics, wave motion, introduction to modern physics. Prereq: Phys 407; Math 425, 426. Lab. 4 cr.

515-516. PHYSICAL MECHANICS I AND II
Analytical treatment of classical mechanics covering dynamics of particles and rigid bodies. Newton's laws, conservation theorems, oscillations, central force problem, generalized coordinates, Lagrange's equations, and fluid dynamics. Prereq: Phys 407; Math 527 for 515, and 528 for 516, or taken concurrently. 3 cr.

602. THERMAL PHYSICS
Classical and statistical approach to thermodynamics, kinetic theory. Prereq: Phys 505; Phys 516 or equivalent; Math 528. 3 cr.

605-606. EXPERIMENTAL PHYSICS I AND II
Circuit design with passive and active elements, electrical measurements for experimental physics, digital electronics and interfacing techniques. Prereq: Phys 505; Math 527 passed or taken concurrently. Lab. 4 cr.

607. OPTICS
Geometrical optics, electromagnetic theory of light, interference, diffraction, polarization, related phenomena and nonlinear optics, Prereq: Math 527; Math 528. Lab. 4 cr.

701-702. INTRODUCTION TO QUANTUM MECHANICS I AND II
Modern physics, nonrelativistic Schroedinger equation, the hydrogen atom, applications to atomic and molecular structure. Prereq: Math 527; Math 528; /or permission. Math 646 desirable. 4 cr.

703-704. ELECTRICITY AND MAGNETISM I AND II
Foundation of electromagnetic theory; electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory. Prereq: Math 527; Math 528; /or permission. Math 646 or 745 desirable. 4 cr.

705-706. EXPERIMENTAL PHYSICS III AND IV
Modern physics experiments and special project problems assigned to individual students. Prereq: senior standing in physics. Lab. 3 cr.

710. INTRODUCTION TO MODERN ASTROPHYSICS
Review of the sun, stars, Milky Way, external galaxies, and expansion of the universe. Recent discoveries of radio galaxies, quasi-stellar objects, cosmic black-body radiation, X rays, and gamma rays precede a discussion of Newtonian and general relativistic cosmological models, steady-state/big-bang theories, and matter-antimatter models. Prereq: Phys 516; Math 527; /or permission. 4 cr.

718. INTRODUCTION TO SOLID STATE PHYSICS
Theory underlying the behavior of solids. Transport theory and the interaction of radiation and matter. Operation of semiconducting and superconducting devices and lasers. Prereq: Phys 516; Phys 701; Math 527; Math 528. 4 cr. (Offered if sufficient demand.)

791. SPECIAL TOPICS
Any selected topics not covered sufficiently in a general course may be studied. May be repeated to eight credits. 4 cr.

795. INDEPENDENT STUDY
Individual project under direction of a faculty adviser. Prereq: department permission. 1–8 cr.

Plant Science (PlSc)

(For program description, see page 47.)

CHAIRPERSON: Owen M. Rogers
PROFESSORS: George O. Estes, Yun-Tzu Kiang, J. Brent Loy, Lincoln C. Peirce, Owen M. Rogers, Douglas G. Routley
ASSOCIATE PROFESSORS: James R. Mitchell, James E. Pollard, John M. Roberts, Otho S. Wells
ASSISTANT PROFESSOR: Thomas Medford Davis

401. PLANT SCIENCE ORIENTATION
Overview of plant science research and teaching facilities; introduction to research, extension, and educational functions within the department; career opportunities in plant science. Required of all first-year plant science majors. 1 cr. Cr/F.

421. CONCEPTS OF PLANT GROWTH
Fundamentals underlying plant growth and response in natural and modified environments. Lab. 4 cr.

427. LANDSCAPING THE HOME GROUNDS
Design and maintenance of small properties; arrangement, plant use for the beautification of home surroundings. Lab. 4 cr.

445. NURSERY CULTURE AND OPERATION
Development of a nursery business from site selection to marketing the finished product; special attention to management of the operation. Prereq: permission. (Also offered as TSAS HT 245.) Lab. 3 cr.

457. CONTROLLED GROWTH STRUCTURES
Various growth structures used in the horticultural industry: construction of structures, selection of heating and watering systems, and efficient utilization of space. Includes, but not limited to, greenhouses, lath houses, and cold frames. Prereq: permission. (Also offered as TSAS HT 257.) Lab. 4 cr.

458. SPRING TRANSPLANT PRODUCTION
Leading bedding/annual plants, vegetable seedlings, perennials and herbs, including cultural requirements, crop timing, distribution systems, and marketing principles. Prereq: permission. (Also offered as TSAS HT 258.) Lab. 3 cr.

463. FLORICULTURAL CROP PRODUCTION
Leading cut flower crops, potted plants, and bulbous crops, including cultural requirements, crop timing, harvesting procedures, distribution systems, and marketing principles. Prereq: permission. (Also offered as TSAS HT 263.) Lab. 3 cr.

535. HISTORY AND USE OF CULTIVATED PLANTS
Importance of cultivated plants in various civilizations. Use of plant or plant-derived products in early and contemporary societies. Lab. 4 cr.

566. TURF MANAGEMENT
Adaptation and management of fine turf grasses for recreational, aesthetic, and functional use. Lab. 4 cr.

604. PRINCIPLES OF GENETICS
Chemical and physical bases of inheritance; genes and chromosomes as units of mutation; genes in

populations. Prereq: basic laboratory course in biological sciences. Organic chemistry; college math or statistics suggested. (Equivalent to Zool 604.) 4 cr.

606. PLANT PHYSIOLOGY
Structure-function relationship of plants, internal and external factors regulating plant growth and development, plant hormones, plant metabolism, water relations, and mineral nutrition. Prereq: Bot 412 or PlSc 421; one year of chemistry; /or permission. Lab. Coreq: PlSc 608. (Also offered as Bot 606.) 3 cr.

607. WEED SCIENCE
Identification of weeds, their biological characteristics, and principles of control in all areas of plant science. Prereq: PlSc 421 or Bot 412. Lab. 4 cr.

608. PLANT PHYSIOLOGY LABORATORY
Analytical techniques for plant physiology, effects of growth regulators on plant growth and development, cell and tissue culture, enzyme kinetics, and plant water relations. Coreq: PlSc 606. (Also offered as Bot 608.) Lab fee. 2 cr.

651. FRUIT CROPS
Tree fruits and small fruits of the temperate zone: culture, management, and marketing for the small enterprise. Lab. 4 cr.

652. VEGETABLE CROPS
A discussion of technology and systems for producing and marketing vegetables locally and nationally, and a study of characteristics of specific crops and of their response to environment. Prereq: PlSc 421 or equivalent. 4 cr.

653. FORAGE CROPS
Selection, establishment, and management of crops grown for livestock utilization; field-oriented lab. Prereq: PlSc 421 or Bot 412 or permission. Lab. 4 cr.

654. CEREAL CROPS
Management practices related to the production and utilization of the world's grain crops. A term project is required. Prereq: PlSc 421 or Bot 412, or permission. 4 cr. (Not offered every year.)

672. PLANT PROPAGATION
Sexual and asexual propagation of horticultural plants. Lab. 4 cr.

678. ORNAMENTAL PLANTS
Their identification, culture, and use. Prereq: Bot 566 or equivalent. Lab. 4 cr.

705. POPULATION GENETICS
Population growth and regulation; genetic variation; factors affecting gene frequency; ecological genetics. Prereq: principles of genetics or permission. 4 cr. (Not offered every year.)

708. PLANT NUTRITION
Nutritional aspects of higher plants; uptake and assimilation, metabolic roles and growth response. Fertilizers: sources, manufacture, application, and energy dependence. Prereq: chemistry. Lab. 4 cr. (Not offered every year.)

711. STATISTICAL METHODS II
Intermediate course; basic concepts of sampling, linear models, and analyses for one-way and multiway classification, factorial arrangement of treatments, multiple regression, and covariance. Computer programs used in analyzing data. Examples from environmental sciences. Prereq: REco 528 or equivalent. Also offered as FoRs 711. 4 cr.

720. LABORATORY TECHNIQUES IN PLANT SCIENCES
Use of laboratory instruments and techniques including extraction procedures, spectrophotometry, fluorometry, electrophoresis, chromatography, atomic absorption spectrometer, measurement of respiration and photosynthesis, photography, use of microscopes, and use of instruments for monitoring the environment. Prereq: chemistry (three semesters) or permission. 3 cr. Cr/F.

740. EVOLUTIONARY BIOLOGY
Origin of life; source of genetic variation, population structure, mechanisms of evolution; molecular evolution; ecological adaptation in animals, plants, and man; community structure and evolution. Prereq: principles of genetics or permission. 4 cr. (Not offered every year.)

750. TOPICS IN AGRICULTURAL APPLICATIONS OF STATISTICS AND COMPUTING
A) Current Applications of Computers in Agriculture; B) Development of Computer Applications in Agriculture; C) Simulation of Crop Development; D) Agricultural Systems; E) Techniques for Field Experiments. Two-credit, 7-week modules offered in the middle of the spring semester. Consult plant science department for current offering. Prereq: permission. 2–10 cr.

762. PLANT METABOLISM
Function, occurrence, synthesis, and degradation of plant constituents; respiration and photosynthesis; metabolism of nitrogenous and aromatic compounds; biochemical mechanisms in seed dormancy, fruit ripening, and disease resistance. Prereq: Bchm 601 or 751. 2 cr. (Not offered every year.)

773. BREEDING IMPROVED VARIETIES
Techniques for creating new varieties of crop and ornamental plants. Prereq: genetics. 3 cr.

776. RADIOISOTOPE TECHNIQUES FOR LIFE SCIENCE
Application of radioisotopes to biological systems; characteristics, detection, measurement, and tissue distribution of radioisotopes. Prereq: chemistry. Lab. 4 cr.

780. BIOTECHNOLOGY AND PLANT GENETICS
Plant cell culture techniques; characterization of economically important traits at the molecular level; approaches to induced mutation, *in vitro* selection, and introduction of foreign DNA into plants; transposable elements and transformation vectors; new ideas in plant biotechnology; social implications. Prereq: course in genetics, plant biol. Lab. 4 cr. (Not offered every year.)

795, 796. ADVANCED TOPICS IN PLANT SCIENCE
Independent research, study, or group discussion. A) Physiology; B) Genetics; C) Plant Utilization; D) Microscopy. Prereq: permission. 2 or 4 cr.

Political Science (Polt)

(For program description, see page 34.)

CHAIRPERSON: David W. Moore
PROFESSORS: Robert B. Dishman, Bernard K. Gordon, George K. Romoser
ASSOCIATE PROFESSORS: Warren R. Brown, Robert E. Craig, John R. Kayser, David L. Larson, David W. Moore, Lawrence W. O'Connell, B. Thomas Trout, Susan O. White, Clifford J. Wirth
ASSISTANT PROFESSOR: Joseph P. Ford
INSTRUCTOR: Aline M. Kuntz

Introductory Courses

400. CONTEMPORARY POLITICS
Examination of varying domestic and international political issues such as censorship, electoral reform, terrorism, international security, corruption, and environmental pollution. 4 cr.

401. POLITICS AND SOCIETY
Introduction to the nature of politics and political institutions. Emphasis on political behavior and continuing issues of modern politics, such as power, authority, legitimacy, freedom, and order. 4 cr.

402. AMERICAN GOVERNMENT AND POLITICS
Institutions and processes of national government in the United States; political culture of the American people. Structure of national government; role of general public in government; cultural influences on American politics. 4 cr.

403. UNITED STATES IN WORLD AFFAIRS
Major issues in world affairs since 1945 as they relate to United States foreign policy: U.S.-Soviet relations, third-world politics, regional and alliance politics, weapons technology and resource depletion, economic development, and population control. 4 cr.

405. SCIENCE OF POLITICS
Introduces students to the quantitative analysis of political problems, using techniques common to all the social sciences. Scientific method as it applies to the social sciences; basic statistical techniques used in political research. 4 cr.

595, 596. EXPLORATIONS IN POLITICS
Designed to meet special interests of students and instructors in exploring selected issues in political science. See departmental listings for semester offerings. 2–4 cr.

American Politics

500. AMERICAN PUBLIC POLICY
Political and economic factors that mold the processes by which American policymakers deal with such domestic issues as crime and violence, poverty and inequality, inflation and unemployment, urban blight and renewal, and energy and the environment. 4 cr.

502. STATE GOVERNMENT AND FEDERALISM
Powers, politics, and constitutional setting of American state governments: state legislatures, governorships, party systems, interest groups, taxation, welfare, environment, and education. 4 cr.

503. LOCAL GOVERNMENT AND POLITICS
Structure, politics, and legal setting of American local government, including towns, cities, counties, and special districts. Community power and decision making; town meetings and such issues as home rule, zoning, and the property tax. 4 cr.

504. AMERICAN PRESIDENCY
Role and powers of the presidency in domestic and foreign affairs. The president as administrator, policymaker, and political leader. Executive-congressional relations. 4 cr.

505. AMERICAN CONGRESS
Role and powers of congress as national lawmaker and check on the executive branch: committee structure, concepts of representation, legislative oversight, and party cleavage, federal budget control and foreign policy involvement. 4 cr.

506. PARTIES, INTEREST GROUPS, AND VOTERS
Role of political parties as organizers and managers of social conflict. Role of voters in controlling parties and government. Influence of interest groups in the electoral process and in governmental decision making. 4 cr.

507. POLITICS OF CRIME AND JUSTICE
Criminal justice in theory and practice; contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the administration of criminal justice. 4 cr.

508. SUPREME COURT AND THE CONSTITUTION
Supreme court treated as a political institution whose historic mission is to decide all controversies arising under the constitution between the nation and the states, the president and congress, governments generally and the people regarding their respective rights and duties. 4 cr.

509. BUREAUCRACY IN AMERICA
Growth and development of the bureaucratic state. Roles and powers of administrative officials, decision making in bureaucratic settings, citizen participation, and the influence of interest groups on bureaucratic policy making. 4 cr.

510. MASS MEDIA IN AMERICAN POLITICS
Contemporary review of media in politics; major roles of media today in providing news, setting public agenda, influencing public opinion; government regulation vs. media responsibility; future developments and consequences for American democracy. 4 cr.

511. MARINE POLICY
Legal and policy aspects of coastal zone, continental shelf, and ocean resource management including fish, oil, gas, pollution, offshore installations, and the deep seabed. 4 cr.

512. PUBLIC OPINION IN AMERICAN POLITICS
Relationship of mass and elite opinion within the context of American political culture. Impact of public opinion on American governmental policies,

especially with respect to major issues facing the president and congress. Appraisal of responsiveness to influence and responsibility to lead. 4 cr.

513. CIVIL RIGHTS AND LIBERTIES
Analysis of three major areas of constitutional rights and liberties—political freedom, equal protection of the laws, and due process—with particular attention to their impact on such problems as political protest, discrimination, school segregation and busing, and student rights. 4 cr.

514. ENERGY POLICY AND POLITICS
Focuses on resources, trends, risks, and futures of all energy forms; energy politics is examined at the federal, state, and local levels and includes the following topics as related to energy: public opinion, Congress, lobbying, the presidency, bureaucracy, regulation of utilities, intergovernmental relations, and the nuclear energy controversy. 4 cr.

600. SELECTED TOPICS IN AMERICAN POLITICS
Special topics such as politics and public affairs in New Hampshire, the press and the media in America, women in politics, and civil liberities. See department listings for semester offerings. 4 cr.

601. ELECTION PRACTICUM
Field work in political campaigns combined with analysis of the electoral process. Prereq: permission. 4 cr. (Not offered every year.)

701. THE COURTS AND PUBLIC POLICY
Impact of judicial decisions on public policy at federal, state, local, and regional levels. 4 cr.

702. PUBLIC PLANNING AND BUDGETING
Analysis, goal setting, and strategic planning in a governmental setting, with particular emphasis on budgetary processes as a means for controlling policy effectiveness. 4 cr.

703. URBAN AND METROPOLITAN POLITICS
Planning and management of the urban community, intergovernment relations, administrative functions, and general urban problems. 4 cr.

704. POLICY AND PROGRAM EVALUATION
Policy and program evaluation of federal, state, and local governmental enterprise; focuses on the politics, practices, and methods of evaluative investigation. Evaluation as a technique for providing rational information for budgetary and policymaking decisions. 4 cr.

797, 798. SECTION B: SEMINAR IN AMERICAN POLITICS
Advanced analysis and individual research. Prereq: senior standing. 4 cr.

797, 798. SECTION F: SEMINAR IN PUBLIC ADMINISTRATION
Advanced analysis and individual research, including opportunities for direct observation of governmental administration. Prereq: senior standing. 4 cr.

Comparative Politics

544. DICTATORSHIP AND TOTALITARIANISM
Political systems of Nazi Germany, Fascist Italy, Stalinist Russia, and Maoist China; the movements that gave rise to them and their significance for understanding political behavior. 4 cr.

550. MAJOR FOREIGN GOVERNMENTS
Concepts for comparing and contrasting modern political systems. Ideologies, political movements, and various forms of the modern state; different models of development and modernization. Examples from Western-style democracies, communist systems, and the developing countries of the Third World. 4 cr.

552. CONTEMPORARY EUROPEAN POLITICS
Politics and governments in Western Europe, with attention to both basic characteristics of political life in different countries and current issues of politics. 4 cr.

553. DEVELOPING NATIONS
Politics in selected developing states in Africa, Latin America, Asia, and the Middle East. Issues and concepts of political change. 4 cr.

555. POLITICS IN THE USSR
Background, structure, leadership, and underlying issues of the Soviet political system. Ideological bases, political history, and contemporary trends. 4 cr.

556. POLITICS IN CHINA
Historical development, structure, ideological bases, and underlying contemporary issues of the Chinese political system; influence of ideology and the role of Maoism. 4 cr.

557. POLITICS IN JAPAN AND SOUTHEAST ASIA
Major noncommunist governments in East Asia; parties and policy making in Japan and other states such as Malaysia, Thailand, Indonesia, and the Philippines. 4 cr.

558. GOVERNMENT AND POLITICS OF CANADA
Cultural background of party competition, role of ideology, structure of government, and contemporary issues in Canadian political system. 4 cr.

651. SELECTED TOPICS IN COMPARATIVE POLITICS
Specialized areas or issues such as regional politics, national politics, judicial systems, administrative law, constitutions, etc. See department listing for semester offerings. 4 cr.

741. POLITICS OF INDUSTRIALIZED STATES
Impact of modern industrialism and its organization upon political life, social structure, and the conduct of government. 4 cr.

742. COMMUNIST SYSTEMS
Interests, demands, and decision making in communist governments. Ideological issues, political behavior within communist international organizations, intraparty relations, distinctions between ruling and nonruling communist parties. 4 cr.

797, 798. SECTION C: SEMINAR IN COMPARATIVE POLITICS
Advanced analysis and individual research on foreign nations or regions, focusing on governmental institutions, foreign policy, political parties, or bureaucracy. Prereq: senior standing. 4 cr.

International Politics

560. WORLD POLITICS
Issues and structures that shape contemporary international politics, including rise of the nation-state system, conflict and its resolution, and problems of national interest and choice between nations. 4 cr.

561. AMERICAN FOREIGN POLICY
Constitutional, institutional, political, and societal factors that influence the formulation and execution of U.S. foreign policy. 4 cr.

562. STRATEGY AND NATIONAL SECURITY POLICY
Defense and deterrence among the major powers, including the impact of modern weapons on war and arms limitations, the military as a profession, and the role of the armed forces in shaping defense policy. 4 cr.

563. FOREIGN POLICIES OF EUROPE
East-West relations, security alliances, economics and political cooperation, and impact of domestic changes and superpower relationships upon the international politics of Europe. 4 cr.

564. SOVIET FOREIGN POLICY
Background and contemporary perspectives of the Soviet role in international politics. Particular emphasis on issues in international communism, Soviet-American relations, Soviet arms development, and Sino-Soviet relations. 4 cr.

565. FOREIGN POLICIES OF ASIA AND THE PACIFIC
Current foreign and defense policies as they affect the Pacific region. International politics of China, Japan, and selected Southeast Asian nations, including their efforts at cooperation. 4 cr.

660. SELECTED TOPICS IN INTERNATIONAL POLITICS
Specialized areas or issues in international relations such as conflict resolution and disarmament, European perspectives on American politics, contemporary diplomatic practices, seapower, and defense. 4 cr.

760. THEORIES OF INTERNATIONAL POLITICS AND INTEGRATION
General explanations of the behavior of nations; theory and practice of supra-national integration; theories of peace and security and community building at the international level; concepts and experience in arms limitations and conflict resolution. 4 cr.

761. INTERNATIONAL LAW
Formalized processes for regularizing state behavior; development of norms based on custom, precedent, and formal institutions, as in treaties and cases. Arms reduction and limitation arrangements; inspection, and other formal procedures designed to preserve peace. 4 cr.

762. POLITICS OF INTERNATIONAL TRADE AND DEVELOPMENT
Explores the postwar global trade system, against the background of calls for increased protectionism. Emphasis given both to domestic as well as to international political considerations. 4 cr.

778. INTERNATIONAL ORGANIZATION
Collective security and other forms of cooperation among nations through international organizations such as the United Nations and its predecessors, and through regional bodies. 4 cr.

797, 798. SECTION E: SEMINAR IN INTERNATIONAL POLITICS
Advanced analysis and individual research; emphasis on developments in theory. Prereq: senior standing. 4 cr.

Political Thought

520. JUSTICE AND THE POLITICAL COMMUNITY
Origin of the idea of justice, relationship between politics, justice, and morality; selections from Plato, Aristotle, Roman, Islamic, and Christian political philosophers. 4 cr.

521. RIGHTS AND THE POLITICAL COMMUNITY
Human rights and the quality of communities as expressed in Hobbes, Locke, Mandeville, Rousseau, and others. 4 cr.

522. DISSENT AND THE POLITICAL COMMUNITY
Current political ideologies and controversies in America and abroad; liberal democracy and its critics since the 19th century. 4 cr.

523. AMERICAN POLITICAL THOUGHT
American political thinkers and observers of American politics; the founding of the Republic; problems and tensions reflected in the writings of Calhoun, Thoreau, Lincoln, de Tocqueville, and others; relations between liberty and authority, democracy and stability, capitalism and alienation. 4 cr.

524. POLITICS AND LITERATURE
Classical and contemporary works of literature to illustrate perennial issues in political philosophy; among authors studied are Aristophanes, Sophocles, Shakespeare, Melville, Tolstoy, and Sartre. 4 cr.

620. SELECTED TOPICS IN POLITICAL THOUGHT
Selected issues in political theory, such as liberalism and conservatism, radical political thought, the American political character, and others. See department listings for semester offerings. 4 cr.

720. PERSPECTIVES ON POLITICAL SCIENCE
Different views on the study and meaning of politics. Perspectives of political scientists, political philosophers, and political activists. 4 cr.

721. POLITICS AND ECONOMICS: POLITICAL ECONOMY AND THE MODERN STATE
The modern state and issues of political economy. This relationship will be covered by treatments of

Adam Smith, David Ricardo, Karl Marx, Max Weber, John Maynard Keynes, and Joseph Schumpeter. In the final stages of course, issues of "supply-side" economics, private and public planning priorities, and current criticism of the welfare state will be discussed. 4 cr.

797, 798. SECTION I: SEMINAR IN POLITICAL THOUGHT
Advanced treatment and individual research. Prereq: senior or graduate standing. 4 cr.

Internships, Advanced Studies, and Honors Thesis

602A, B. INTERNSHIP IN POLITICAL SCIENCE
Field experience in a governmental or nongovernmental organization at the local, state, national, or international level. Arrangements should be made through the political science department. Open to juniors or seniors with at least a 3.00 GPA. Permission of the Undergraduate Program Committee of the department is required prior to the internship. From 4 to 16 credits may be taken; however, only four credits may be for grade. The rest will be credit/fail, and only four credits may be applied to the political science major. May be taken in conjunction with Advanced Study in Political Science. 602 A) Variable 4–12 cr. Cr/F. 602 B) 4 cr. Letter grade.

795, 796. ADVANCED STUDY IN POLITICAL SCIENCE
Senior students, majoring in political science, with a cumulative average of 3.20 or greater, may undertake advanced study (political science), in an area of their choice, in consultation with member(s) of the faculty. Normally, the result of the project will be a significant written product of a quality comparable to that done at the 700 course level. Students must initiate the project discussion and obtain approval of the Undergraduate Program Committee of the department prior to undertaking the project. The advanced study project will constitute the tenth course in the major, and the department will recognize the completion of advanced study by recognizing the student as having completed the major "with distinction." 4 cr.

799. HONORS THESIS
Senior students, majoring in political science, with a cumulative average of 3.50 or greater, and an average in their majors of 3.67 or greater, may undertake a special honors project in an area of their choice. The results of this special project will be a significant written product constituting an honors thesis, under the supervision of a faculty sponsor. Students must initiate the project discussion and obtain the approval of the Undergraduate Program Committee prior to undertaking the project. The honors thesis will constitute the tenth course in the major and will earn the student an official recognition as having completed an Honors Program in Political Science. 4 cr.

Portuguese

(See Spanish and Classics.)

Program for International Perspectives (PIP)

(For program description, see page 85.)

401. INTERNATIONAL PERSPECTIVES: SCIENCE, BUSINESS, AND POLITICS
An examination of the interaction of developments in science, economics, and politics as they shape international affairs. Topics include science and technology; world trade and investment; politics, cultural values, and ethics in world affairs. This is a team-taught, modular course. 4 cr.

501. NORTH-SOUTH ISSUES IN INTERNATIONAL AFFAIRS
A comprehensive survey of underlying economic and social differences creating the dialogue and conflicts between the Third World and the industrialized nations. Preference will be given to those who have completed PIP 401 and to dual majors. 4 cr.

601-602. FOREIGN EXPERIENCE
Dual majors will register for PIP 601 or 602 for foreign experience situations not covered by the foreign language departments' Study Abroad (685-686). Most commonly this will be study in a non-English-speaking country for a summer or a semester. It should be in a country where the language spoken is that which the student presents to satisfy his/her foreign language requirement. The University Committee on International Studies will consider alternative experiences such as internships or purposeful travel upon petition. Prereq: permission. 0 to 16 credits. (Financial aid requires a minimum of 6 cr.) Cr/F.

699. TOPICS IN INTERNATIONAL AFFAIRS
Special topics course with varying subject matter and format. Study of areas and subjects not covered by existing courses. Center for International Perspectives provides information on current offering. Recommended as a dual major elective. 4 cr.

701. SEMINAR IN INTERNATIONAL AFFAIRS
Capstone of the dual major in international affairs. It is to be taken after completion of the foreign language and foreign experience requirements. The seminar has strong emphasis on research and analysis, use of foreign language skills, writing, and criticism. Prereq: permission. 4 cr.

Psychology (Psyc)

(For program description, see page 34.)

CHAIRPERSON: Earl C. Hagstrom
PROFESSORS: Raymond L. Erickson, Gordon A. Haaland, John A. Nevin
ASSOCIATE PROFESSORS: William M. Baum, Victor A. Benassi, Ellen S. Cohn, Peter S. Fernald, Kenneth Fuld, Earl C. Hagstrom, David E. Leary, John E. Limber, Carolyn J. Mebert, Daniel C. Williams, William R. Woodward
ASSISTANT PROFESSORS: Joseph P. Blount, Esther Goldminz, Albrecht W. Inhoff, Robert G. Mair, Judith C. Meyers, William Stine, Rebecca M. Warner

The listings that follow are general descriptions of the courses. Students are referred to the Instructors' Course Descriptions published by the department

each semester for specific details about each section. Listings will be made available in departmental offices before and during the preregistration period.

Psychology 401 is a prerequisite for all courses in the psychology department except psychology 491, 571, 572, and 770.

Psychology 402 is a prerequisite for all 700-level psychology courses except 770 and 771.

General Courses

401. INTRODUCTION TO PSYCHOLOGY
Psychology as a behavioral science; its theoretical and applied aspects. Coverage of basic topics in the field, including developmental, learning, personality, abnormal, social, perceptual/sensory, and physiological psychology. To experience actively the nature of psychological research, students have an opportunity to participate in a variety of studies as part of a laboratory experience. 4 cr.

461. CLINICAL APPROACHES TO HUMAN BEHAVIOR
Normal and abnormal behavior from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. Human behavior; clinical procedures of evaluating and modifying behavior. Nature of the clinical approach; no clinical training. Prereq: Psyc 401. (Not for major credit.) 4 cr.

491. GENERAL TOPICS IN PSYCHOLOGY
New courses of general interest and focus are presented under this listing. The staff will present material not normally covered in regular course offerings. May repeat but not duplicate areas. Not for major credit. 4 cr.

Major Courses

402. STATISTICS IN PSYCHOLOGY
Design, statistical analysis, and decision making in psychological research. Substantive problems as illustrations of typical applications and underlying logic. Prereq: Psyc 401. 4 cr.

502. RESEARCH METHODS IN PSYCHOLOGY
Research design, including experimental and correlation design; internal versus external validity; measurement; writing a research report; graphic and statistical methods for summarizing data; sampling; and special problems such as experimenter effects, reactivity of measurement, and others. The use of hypothesis testing and data analysis in research. Prereq: Psyc 401 and 402. 4 cr.

511. INTRODUCTION TO PERCEPTION, LANGUAGE, AND THOUGHT
Human mental processes. Visual and auditory perception; language; attention; memory; decision processes; problem solving; creativity. Interrelationships among these areas of human psychology. Prereq: Psyc 401. 4 cr.

512. PSYCHOLOGY OF PRIMATES
A comparative analysis of primate cognitive, linguistic, and social processes. The origins of human behavior will be explored from the perspectives of history, evolution, and contemporary work in neuropsychology, linguistics, sociobiology, and related fields. Prereq: Psyc 401. 4 cr.

521. PRINCIPLES OF LEARNING AND THEIR APPLICATION
Principles developed from experimental study of human and animal learning; their theoretical integration; their application to the understanding of human behavior. Procedures for changing behavior in practical situations, related to theories of learning. Prereq: Psyc 401. 4 cr.

522. BEHAVIORISM
Introduction to behaviorism as a philosophy of science. Some historical background, but concentration on modern behaviorism as exemplified in the works of B.F. Skinner. Prereq: Psyc 401. 4 cr.

531. PSYCHOBIOLOGY
The human as a biological machine; advantages and limits of such an approach for studying behavior. Perception, language, and thought; learning and memory; emotions from the point of view of physiology. Prereq: Psyc 401. 4 cr.

551. PSYCHOLOGY OF SEX ROLES
The psychology of women and men, and sex-role differences in socialization, personality, achievement motivation, altruism, aggression, power, etc. Prereq: Psyc 401. 4 cr.

552. SOCIAL PSYCHOLOGY
Behavior of individuals as affected by other individuals, groups, and society. Topics include attitude change and social influence, conformity, social interaction, interpersonal attraction, impression formation, research. Prereq: Psyc 401. 4 cr.

553. PERSONALITY
Major theories, methods of assessment, and research. Prereq: Psyc 401. 4 cr.

571. THE GREAT PSYCHOLOGISTS
Historical introduction to some of the great psychologists and their classic works. 4 cr.

581. CHILD DEVELOPMENT
The developing child in the context of his/her society. Current problems in and influences on development of the child. Personality and cognitive development; exceptional children. Prereq: Psyc 401. 4 cr.

582. ADULT DEVELOPMENT
Personality, social, cognitive development of the adult within society. Prereq: Psyc 401. 4 cr.

702. ADVANCED STATISTICS AND RESEARCH METHODOLOGY
Experimental design, analysis, and interpretation. Repeated measures, designs, trend analyses, nonparametric analyses, confounding, missing data, interpretation of interactions, and computer processing of data. Intended primarily for majors planning to attend graduate school. Prereq: Psyc 402; 502; /or permission. 4 cr. (Not offered every year.)

703. EXPERIMENTAL PSYCHOLOGY
Experimental methods applied to psychological processes; principles of experimental design; methods of data analysis. Each student responsible for an original experiment. Prereq: Psyc 402; 502; /or permission. 5 cr.

704. RESEARCH METHODS IN SOCIAL PSYCHOLOGY
Features, assets, liabilities, and appropriate applications of measurement, survey methods, field and laboratory experiments, and non-reactive methods. Philosophy of science, ethical responsibility, and artifact in research. Each student responsible for an original research project. Prereq: Psyc 402; 502; 552; /or permission. 4 cr.

705. TESTS AND MEASUREMENT
Testing intelligence, creativity, achievement, interests, and personality. Test construction; evaluation; relation to psychological theory, research, and practice. Prereq: Psyc 402; 502; /or permission. 4 cr.

710. VISUAL PERCEPTION
Anatomy, physiology, psychophysics, and perceptual processes of vision. Topics include physics of light, psychophysics, color, space and form, depth, motion, eye movements, visual learning and development, constancy, and illusions. Prereq: Psyc 402; 502; 511; /or permission. 4 cr.

711. SENSATION AND PERCEPTION
Anatomy, physiology, psychophysics, and perceptual processes of the visual, auditory, gustatory, olfactory, and cutaneous senses. Topics include stimulus definition, psychophysics, sensory transduction, sensory and perceptual adaptation, neural coding of space, time, magnitude, and quality. Prereq: Psyc 402; 502; 511 or 512; /or permission. 4 cr.

712. PSYCHOLOGY OF LANGUAGE
Theories of language structure; functions of human language; meaning; relationship of language to other mental processes; language acquisition; indices of language development; speech perception; reading. Prereq: Psyc 402; 502; 511 or 512; /or permission. 4 cr.

713. COGNITION
Complex mental activities; consciousness and attention; concept formation; reasoning; problem solving; creative thinking; relationship between cognition and affective behavior. Prereq: Psyc 402; 502; 511 or 512; /or permission. 4 cr.

721. THE EXPERIMENTAL ANALYSIS OF BEHAVIOR
Environmental and biological determiners of behavior. Theory, research methods, and applications. Major concepts and recent research. Prereq: Psyc 402; 502; 521 /or permission. 4 cr.

722. HUMAN LEARNING
Experimental study of human learning and retention. Memory, transfer, verbal learning, perceptual learning, concept learning, and observational learning. Methodologies typical of research in these areas. Prereq: Psyc 402; 502; 512 or 521 or 703; /or permission. 4 cr.

723. APPLIED BEHAVIORAL ANALYSIS
Applications of learning theory to the solution of socially relevant problems. Appreciation of current research and theory in the field of applied behavior analysis. Prereq: Psyc 402; 502; 521 or 703; /or permission. 4 cr.

731. BRAIN AND BEHAVIOR
Relationships between the nervous system and behavior. Physiological, neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in humans; evolution of these functions in lower animals. Prereq: Psyc 402; 502; 531; /or permission. 4 cr.

732. COMPARATIVE PSYCHOLOGY
Comparisons of the basic processes of sensation, motivation, learning, and social behavior in different species. Contemporary theories of behavior formulated by ethologists and ecologists contrasted and compared with current theories in psychology. Prereq: Psyc 402; 502; 512 or 521; /or permission. 4 cr.

752. ADVANCED SOCIAL PSYCHOLOGY
A general survey of current research and major theories. An in-depth critical analysis of selected topics such as attribution theory, social cognition, and theories of aggression. Prereq: Psyc 402; 502; 552; /or permission. 4 cr.

755. SOCIAL PSYCHOLOGY OF SOCIAL ISSUES
Crime, violence in the family, aging, television, health, politics, and behavior of men and women. Specific social psychological processes applied to the nature and solution of each problem. Prereq: Psyc 402; 502; 552 /or permission. 4 cr.

756. ENVIRONMENTAL PSYCHOLOGY
Human behavior as influenced by the natural and personmade physical environment. Coverage of research and theory on such topics as privacy, territoriality, crowding, personal space, urban stress, behaviorally based design, paralinguistics, and behavior in natural settings. Prereq: Psyc 402; 502; 552; /or permission. 4 cr.

761. ABNORMAL BEHAVIOR
Disturbing behaviors; historical developments; viewpoints of etiology; identifying and understanding disruptive behavior; diagnostic implications for treatment as a function of varying theoretical viewpoints. Prereq: Psyc 402; 502; 553; /or permission. 4 cr.

762. COUNSELING
Theories of counseling; ethical considerations; professional and paraprofessional activities in a variety of work settings. Prereq: Psyc 402; 502; 553 or 461; /or permission. 4 cr.

770. HISTORY OF PSYCHOLOGY
Survey of the history of psychology up to the 20th century. Major figures, theories, and developments. Relationship to developments in cultural history, philosophy, and the natural sciences. Beginnings of modern scientific psychology. 4 cr.

771. PSYCHOLOGY IN 20TH-CENTURY THOUGHT AND SOCIETY
Reassesses, extends, and integrates knowledge of 20th-century psychology within the historical perspective. Major figures, schools, systems, theories. Social, institutional, and international developments since the 19th century. Review of major fields of psychology. Prereq: Psyc 401. 4 cr.

781. DEVELOPMENTAL PSYCHOLOGY
Current research and major theories; cognitive, personality, learning, and emotional development. Prereq: 402; 502; 512 or 581 or 582 or FCS 525; /or permission. 4 cr.

783. DEVELOPMENTAL PSYCHOPATHOLOGY
Major issues in psychopathology from a developmental perspective. Emphasis on theories of etiology, approaches to treatment, and research issues in a variety of atypical populations. Diagnostic classification schemes, rights of children, and methods of assessment. Prereq: Psyc 402; 502; 581; /or permission. 4 cr.

Special Courses

591. SPECIAL TOPICS IN PSYCHOLOGY
New or specialized courses are presented under this listing. Staff present material not normally covered in regular course offerings. May repeat but not duplicate areas. Prereq: Psyc 401. 4 cr.

791. ADVANCED TOPICS
Advanced material in which instructor has specialized knowledge through research and study. May repeat but not duplicate areas. Prereq: Psyc 402; 502; /or permission. 4 cr.

793. EXTERNSHIP
Supervised practicum in one of several cooperating New Hampshire mental health/rehabilitation facilities. Coursework knowledge applied to meaningful work and team experience. Commitment includes a negotiated number of weekly work hours and weekly seminars. Supervision by institution personnel and the instructor. Course applications accepted beginning in March for fall term and October for spring term. Prereq: permission; Psyc major; Psyc 402; 502; additional psychology courses desirable. A maximum of 4 credits of 793, 794, and 795 can count toward the minimum of 36 credits for Psyc major. Up to 8 cr.

794. ADVANCED EXTERNSHIP
Supervised advanced practicum experience in cooperating New Hampshire mental health/rehabilitation facilities. Expands and builds on experiences and skills acquired in Psyc 793. Commitment includes a negotiated number of hours of work per week and participation in weekly seminars. Supervision done by institution personnel and instructor. Course applications accepted beginning in October for spring term. Prereq: Psyc 793; permission. Maximum of four credits of 793, 794, and 795 can count toward the minimum of 36 credits for Psyc major. Up to 8 cr. (Offered spring semester only.)

795. INDEPENDENT STUDY
A) Physiological; B) Perception; C) History and Theory; D) Learning; E) Social; F) Cognition; G) Statistics and Methods; H) Experimental; I) Personality; J) Developmental; K) Counseling; L) Psychotherapy; M) Research Apprenticeship; N) Teaching of Psychology (content area to be determined). Specific independent study opportunities are sometimes posted in the psychology offices. Arrangements to be made with a specific faculty member; enrollment by permission only. A maximum of 4 credits of 793, 794, and 795 can count toward the minimum of 36 credits for Psyc major. Prereq: Psyc 402; 502; /or permission. 1–4 cr.

Religious Studies (R S)

(For program description, see page 25.)

COORDINATOR: Marc L. Schwarz

416. MASTERPIECES OF RELIGIOUS LITERATURE
An introduction to at least four great works of religious literature, methods and perspectives of interpretation, and the fundamental ideas and attitudes toward life that they express. 4 cr.

501. CONTEMPORARY APPROACHES TO THE STUDY OF RELIGION
A variety of contemporary methods for studying religion, as well as an analysis of such significant cross-cultural continuities in various religious traditions as mythology, ritual, canon, etc. 4 cr.

599. SPECIAL TOPICS
Studies of particular religious traditions, or periods within those traditions, or special topics and issues of concern within religious studies such as mythology, ritual, mysticism, etc. 4 cr.

695, 696. INDEPENDENT STUDY
Independent study of traditions, topics, or figures within the scope of religious studies. Before registration, student must formulate a project and secure consent of a cooperating department faculty member who will supervise the independent study. 2 or 4 cr.

699. SENIOR SEMINAR
A capstone experience intended to help students draw together their various studies in the field of religion. Prereq: any two courses in religious studies or permission. 4 cr.

Reserve Officers Training Corps

(For program description, see page 85.)

(See Aerospace Studies and Military Science.)

Resource Economics and Community Development

CHAIRPERSON: Edmund F. Jansen, Jr.
PROFESSORS: William H. Drew, Owen B. Durgin, Edmund F. Jansen, Jr.
ASSOCIATE PROFESSORS: Bruce E. Lindsay, Albert E. Luloff, Douglas E. Morris
ADJUNCT ASSOCIATE PROFESSORS: Betty Holroyd Roberts, Charles F. Tucker
ASSISTANT PROFESSOR: Alberto Manalo
LECTURER: George E. Frick
EXTENSION EDUCATORS: Gerald W. Howe, Michael R. Sciabarrasi

Community Development (C D)

(For program description, see page 44.)

507. INTRODUCTION TO COMMUNITY AND COMMUNITY DEVELOPMENT
Principal theories and methods of community and community development; skills required to help

people enhance the social and economic well-being of their communities. Institutional structures; change processes; citizen participation in decision making; and problem analysis in contemporary, nonmetropolitan communities in New England. Lab. 4 cr.

508. APPLIED COMMUNITY DEVELOPMENT
Students work in an actual community, assisting individuals and groups to identify needs and problems, establish attainable and objective goals, assess requirements and resources, and formulate programs for development; methods of collection, analysis and integration of pertinent primary and secondary economic, social, political, and physical data for community development. Prereq: C D 507 or permission. Lab. 4 cr.

614. COMMUNITY PLANNING
Community planning process in nonmetropolitan communities; practical application of planning techniques. Community components: housing, jobs, schools, recreation, transportation; community appearance and the administrative structure for planning. Use of planning tools: data gathering and analysis, the master plan, zoning and subdivision regulations, community development programs. Prereq: REco 411; C D 507; /or permission. 4 cr. (Not offered every year.)

627. COMMUNITY ECONOMICS AND FINANCE
Economic and financial factors affecting community and local government decisions. Emphasis on use of economic theory and analytical techniques to evaluate problems in contemporary New England communities and towns. Prereq: REco 411 or Econ 402. (Also offered as REco 627.) 4 cr. (Offered every other year.)

628. COMMUNITY CONFLICT AND CONSENSUS
Topics drawn from the literature on community stratification, conflict resolution, leadership, power, and development. Emphasis on historical and contemporary theory and research. May include class field research project. Prereq: C D 507; REco 528 or equivalent; and/or permission. 4 cr. (Offered every other year.)

705. PLANNED CHANGE IN NONMETROPOLITAN COMMUNITIES
Discussion and application of community development theory and principles using appropriate research methodologies. Areas of study chosen from: population growth, community planning and development, provision and distribution of services, rural-urban differences, and systems management. Emphasis on empirical research studies. Students may participate in community-development activities. May include placement in field agency. Prereq: C D 508; REco 701 or equivalent; permission. 4 cr. (Offered in even years only.)

710. COMMUNITY DEVELOPMENT SEMINAR
Seminars arranged to students' needs and offered as demand warrants: in-depth treatment of area, including classic works. May be repeated. 2–4 cr.

717. LAW OF COMMUNITY PLANNING
Common law and the Constitution with respect to property law, including eminent domain, land-use planning, urban renewal, and zoning. Makes the nonlawyer aware of the influence and operation of the legal system in community development. 4 cr.

795, 796. INVESTIGATIONS IN COMMUNITY DEVELOPMENT
Special assignments in readings, investigations, or field problems. May be repeated. Prereq: permission. 2–4 cr.

Resource Economics (REco)

(For program description, see page 48.)

411. RESOURCE ECONOMICS PERSPECTIVES
Microeconomic theory and analysis in resource management and use decisions. A survey of significant resource problems from an economic perspective and the application of economic analysis. Cannot be taken for credit after Econ 402 or equivalent. 4 cr.

501. AGRICULTURAL AND NATURAL RESOURCE PRODUCT MARKETING
Structure, organization, and performance of the business section in agriculture, forestry, and other local natural resource-based industries; commodity marketing systems; demand estimation, pricing policies, consumer characteristics, and related topics. Prereq: REco 411 or equivalent; /or permission. 4 cr. (Offered every third semester.)

504. FARM BUSINESS MANAGEMENT
Planning, operation, and control of the farm with application to natural resource-based businesses. Emphasis on decision making, problem solving, and operational strategies. Prereq: REco 411 or equivalent. Lab. 4 cr.

506. POPULATION, FOOD, AND RESOURCE USE IN DEVELOPING COUNTRIES
Economic, technical, cultural, social, and political factors that influence food supplies, nutrition resource use, employment, and income distribution in the developing countries; the population explosion; strategies for expanding food supplies; social and institutional constraints, strategies and policies for economic development. Prereq: REco 411 or equivalent. 4 cr. (Offered every third semester.)

512. GULF OF MAINE ECONOMIC RESOURCES
Topics include fisheries management, oil and gas recovery, and ocean minerals mining. Lab and field work will include opportunity to observe and interview those professionally involved in harvesting marine resources in the Gulf of Maine. Offered as a one-week course at the Shoals Marine Laboratory. Prereq: introductory economics course or permission. 1 cr. (Summers only.)

528. APPLIED STATISTICS I
Development of elementary statistical techniques through the analysis of prepared data. Continuous and discrete probability distributions; distributions of sample statistics; small-sample theory; regression; correlation; analysis of variance. Permission of instructor required for upper-division students. 4 cr. (Not offered every semester.)

595, 596. PROBLEMS IN NATURAL AND AGRICULTURAL RESOURCES
Students pursue field, laboratory, or library problems in natural and environmental resources that are not covered by other courses. A faculty consultant and a study topic must be chosen prior to registration for the course. In consultation with the faculty adviser, students are expected to select the problem area, create a bibliography for reflection, and find channels to actively pursue the topic. A professionally written paper is expected at termination of the study. May be repeated once for credit. Prereq: permission. 2–4 cr.

604. AGRIBUSINESS FINANCE
Concepts of farm and agribusiness financial decision making, financial statement analysis, investment analysis, risk management, financing new investments, and asset appraisal. Prereq: introductory microeconomic theory; REco 504 desired or permission. Lab. 4 cr. (Offered every third semester.)

606. LAND USE ECONOMICS
Economic and institutional factors affecting human use of land resources; historical discussion of land ownership patterns; supply and demand; production relationships; location and resource use; benefit-cost analysis; institutional restraints and planning for more efficient use of land. The real estate market and taxation. Prereq: REco 411 or equivalent. 4 cr. (Offered every third semester.)

611. MARINE RESOURCE ECONOMICS
Economic overview of the marine environment; interactions/conflicts surrounding this multiple-use resource. Economics of fisheries; marine recreation; offshore facilities; aquaculture; waste disposal. Prereq: REco 411 or Econ 402; /or permission. 4 cr. (Offered every third semester.)

615. LINEAR PROGRAMMING METHODS
Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications; nonlinear programming, discrete programming; and solving input-output and game-theory problems. Applications to firm and aggregate economic analysis. Prereq: elementary matrix algebra or permission. 4 cr. (Offered every third semester.)

627. COMMUNITY ECONOMICS AND FINANCE
Economic and financial factors affecting community and local government decisions. Emphasis on use of economic theory and analytical techniques to evaluate problems in contemporary New England communities and towns. Prereq: REco 411 or Econ 402. (Also offered as C D 627.) 4 cr. (Offered every other year.)

676. ECONOMICS OF WATER USE AND QUALITY MANAGEMENT
Economics of water use; role of government and policy agencies, water supply and demand, economic impact of water and water quality standards, alternatives in quality management, externalities, and methods of evaluation. Prereq: elementary biological or physical science (or FoRs 504); elementary economics. 4 cr. (Offered every third semester.)

701. STATISTICAL METHODS I
Analysis of variance and general linear model; measured numbers, nature of statistical evidence, sampling distributions, and principles of statistical inference; application of specific linear models to given sets of data. Prereq: upper-division undergraduate or graduate standing. 4 cr. (Not offered every semester.)

702. NATURAL RESOURCES POLICY
Contemporary issues in the management and allocation of natural resources; impact of humans on agricultural and forest lands, water, wildlife, fisheries, and minerals; historical perspective of current resource policies. 4 cr. (Also offered as E C 702.)

704. AGRICULTURAL AND FOOD POLICY
Issues and problems in agricultural and food policy in the United States are identified and analyzed from the perspective of producers, consumers, and the government. Economic, political, and social consequences of alternative policies and programs are evaluated. Prereq: REco 411 or equivalent. 4 cr.

706. ECONOMICS OF RESOURCE DEVELOPMENT
Resource scarcity and theories of economic development; major resource development problems of land and natural resources, urban-rural conflicting demands, and conservation and water supply; capital needs, externalities, and market failure. Prereq: intermediate economic theory. 4 cr. (Offered every third semester.)

708. ENVIRONMENTAL ECONOMICS
Environmental pollution, the market economy, and optimal resource allocation; alternative control procedures; levels of environmental protection and public policy; property right issues. Prereq: intermediate microeconomic theory; permission. 4 cr. (Offered every third semester.)

710. RESOURCE ECONOMICS SEMINAR
Seminars arranged to students' needs and offered as demand warrants: A) Rural Development; B) Marine Economics; C) Community Economics; D) Land and Water Economics; E) Quantitative Methods; F) Recreation Economics. In-depth treatment of area, including classic works. May be repeated. 2–4 cr.

718. LAW OF NATURAL RESOURCES AND ENVIRONMENT
For resource managers: the legal system pertaining to resource management, protection of the environment, and possibilities for future action. Prereq: E C 635 or REco 606 or permission. (Also offered as E C 718.) 3 cr. (Not offered every year.)

756. REGIONAL ECONOMIC ANALYSIS
Concepts and methods of delineating regional economies, methods of measuring activity, regional development, and public policies. Emphasis on empirical research studies. Prereq: intermediate economic theory or permission. 4 cr. (Offered every third semester.)

795. INVESTIGATIONS IN RESOURCE ECONOMICS
Special assignments in readings, investigations, or field problems. A) Agricultural Marketing; B) Agricultural Production and Farm Management; C) Community Development; D) Economics of Human Resources; E) Economics of Population and Food; F) Land Economics; G) Marine Economics; H) Rural Economic Development; I) Regional Eco-

nomics; J) Water Economics. Prereq: permission. May be repeated. Variable 2–4 cr.

Russian

(See German and Russian.)

School of Health Studies (SHS)

(For program description, see page 69.)

400. HEALTH-HUMAN VALUES
Physiological, emotional, social, and environmental factors affecting health. Basic health information to broaden understanding of health-related issues. Students examine their patterns of decision making in issues directly affecting their lives. Also offered as O T 400. 4 cr.

798. SPECIAL TOPICS IN HEALTH STUDIES
Students may explore areas related to specific professional health interests. May repeat but not duplicate subject areas. A) Communication Disorders; B) Health Administration and Planning; C) Medical Technology; D) Nursing; E) Occupational Therapy; F) Physical Education; G) Leisure Management and Tourism; H-Z) Interdisciplinary. Prereq: permission. 1–4 cr.

Secretarial Studies (Secr)

(For program description, see page 80.)

ASSOCIATE PROFESSOR: Myra L. Davis

401-402. SHORTHAND
Principles of Gregg shorthand followed by dictation and transcription. Prereq: proficiency in typing or Secr 405 or 407 taken concurrently. 4 cr.

405. PERSONAL USE TYPEWRITING
Practice in acquiring correct typewriting techniques and in arranging letters and manuscripts. Open to students who do not know how to type. 2 cr. Cr/F.

407-408. TYPEWRITING
Beginning course, primarily for students interested in two semesters. 2 cr.

427. TYPEWRITING
To be taken instead of Secr 407 by students who have had a personal-use typewriting course. Class begins at midsemester. 1 cr.

Social Science (ScSc)

Coordinators for the Social Science Division, College of Liberal Arts, are Barbara Millar and the chairperson of the Social Science Division.

681. INTERNSHIPS
Fieldwork in a state or local government department, agency, or institution, or in an approved private agency. Work will be under supervision of agency. Department chairperson or representative is responsible for arranging the program. Offered through Departments of History, Political Science, Psychology, Sociology and Anthropology, or the Whittemore School of Business and Economics. Prereq: senior standing. Variable to 16 cr.

682. WASHINGTON INTERNSHIP
Internship placements in Washington, D.C., through the Washington Center. Individual internships arranged with legislative and judicial offices, law firms, public interest organizations; in the arts, the media, labor, international affairs, business, consumer affairs. Supervision by agency personnel and faculty sponsor. Students should have above-average academic record prior to applying. Open to all majors. Applications available in the Whittemore School dean's office, McConnell Hall. Prereq: second semester junior, or senior. Student must also register for a graded, 4-credit independent study in the student's major. Internship credit variable to 12 cr. Cr/F.

Social Service (S S)

(For program description, see page 35.)

CHAIRPERSON: Betty Holroyd Roberts
ASSOCIATE PROFESSORS: Robert E. Jolley, Betty Holroyd Roberts, Pauline Soukaris
ASSISTANT PROFESSOR: Stephen H. Gorin

524. INTRODUCTION TO SOCIAL WORK AND SOCIAL WELFARE
The role of social work within agency structures. Programs, policies, social work services studied in historical perspective; their auspices, goals, and operations for consumers from various ethnic, racial, and social groups. Weekly observational/participatory assignments at community agencies. 4 cr.

525. INTRODUCTION TO SOCIAL WELFARE POLICY: PROVISIONS
U.S. social welfare provisions: income, housing, employment, and health care. Program and policies in historical perspective: their auspices, goals, and operations for consumers from various social, racial, and ethnic groups. 4 cr.

550. HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT I
Introduction to human behavior and development as it influences and is influenced by multiple factors in the social environment, including individual genetic and biological composition, race, gender, age, socio-economic status, ethnicity, geographic location, physical appearance, and ability. How these factors operate throughout the life cycle. Provides a knowledge base and perspective to understand a client's behavior, attitude, and values in relation to the attitudes and values of the social work professional and the larger society. 4 cr.

551. HUMAN BEHAVIOR AND SOCIAL ENVIRONMENT II
Continuation of 550. Agents of socialization that most significantly affect individual development and behavior, and a dynamic and changeable concept of social systems as they affect individual and group behavior in relation to the dominant society. Prereq: S S 550; major. 4 cr.

622. SOCIAL WORK PRACTICE I
Introduction to methods and practice. Basic principles, values, and ethics. Interviewing skills, problem assessment, social contracting. Skills training in lab sessions. Required for majors, should be taken in junior year. Prereq: S S 524 or permission. 4 cr.

623. SOCIAL WORK PRACTICE II
Continuation of S S 622. Delineation and study of intervention and change strategies differentiated with individuals, groups, and communities. Required for majors. Prereq: S S 622. 4 cr.

632. SPECIAL TOPICS IN SOCIAL WELFARE
Seminar for advanced majors. Topics may include income maintenance, alcoholism, health care, aging, child welfare, and mental health; to increase understanding of factors that influence program development and service delivery. 4 cr.

633. SEMINAR IN SOCIAL WORK METHODS
Analysis and comparison of change theories, intervention strategies, therapeutic techniques. Seminar format. Possible topics: techniques of group work, casework or community practice, behavior modification, and staff development and supervision. Prereq: senior major standing. 4 cr.

640. SOCIAL WELFARE FIELD EXPERIENCE: I
Majors will be placed in a social welfare setting for a minimum of 225 hours, concurrent with a weekly seminar on campus; individual arrangements with faculty coordinator. Required for majors. Prereq: S S 623 and permission. (No credit toward a minor.) 8 cr. Cr/F.

641. SOCIAL WELFARE FIELD EXPERIENCE: II
A continuation of S S 640 with a minimum of 225 hours. Required for majors. Prereq: S S 640 and permission. (No credit toward a minor.) 8 cr. Cr/F.

700. SOCIAL GERONTOLOGY
Theories, social problems, programmatic responses, and recent research on aging; emphasis on the psycho-social forces. Prereq: senior status; /or permission. 4 cr.

701. WOMEN AND AGING
An analysis of the major theories about the social conditioning of aging women and its effect in contemporary society. Human service response will be addressed. Psycho-social, biological, legal, and economic implications will be reviewed. Prereq: senior status or permission. 4 cr.

705. CHILD WELFARE: POLICIES, PROGRAMS, AND PRACTICE
An examination of the major policy and program questions of child welfare with a focus on child care and protection, adoption and foster care, juvenile delinquency, service delivery, and concepts of treatment in public and private programs. Prereq: senior status or permission. 4 cr.

795, 796. INDEPENDENT STUDY IN SOCIAL SERVICE
Independent work under social service faculty guidance. Prereq: 12 hours social service coursework; permission. Variable 1—6 cr. Cr/F.

Sociology and Anthropology

CHAIRPERSON: Peter Dodge

PROFESSORS: Melvin T. Bobick, Walter F. Buckley, Bud B. Khleif, Arnold S. Linsky, Stuart Palmer, Solomon Poll, Frederick Samuels, Murray A. Straus
ASSOCIATE PROFESSORS: Charles E. Bolian, Peter Dodge, Richard E. Downs, Lawrence C. Hamilton, Barbara K. Larson, Stephen P. Reyna, Sally Ward, Kirk Williams, Deborah Winslow

Anthropology (Anth)

(For program description, see page 26.)

411. CULTURAL AND SOCIAL ANTHROPOLOGY
Cultural and social aspects of human behavior, particularly in relation to nonindustrial societies. Analysis of selected societies, institutions, and forms of social structure. 4 cr.

412. PHYSICAL ANTHROPOLOGY AND PREHISTORIC ARCHAEOLOGY
Human physical evolution and cultural prehistory; evolutionary theory and archaeological techniques. 4 cr.

500. PEOPLES AND CULTURES OF THE WORLD
A) North America; B) South America; C) Middle East and North Africa; D) Sub-Saharan Africa; E) South Asia; F) Southeast Asia; G) Oceania; H) Other.

Characteristic ecological, historical, and sociocultural factors in the major ethnographic regions of the globe. Analysis of selected societies and institutions. Offered in the following sections as staff is available and student needs dictate. *North America:* Study of the economy, society, religion, art, and ideas of North American Indians from precolonial times to the present. *South America:* A survey of the indigenous cultures and selected studies of the relationship between environment and culture. Changes in culture and social organization since the 16th century will be considered where historical data permit. *Middle East* and *North Africa:* The role of ecological, social, cultural, and historical factors in shaping Middle Eastern and North African culture today. Special attention will be paid to family, values, and religion; to nomadic, village, and urban ways of life; and to issues of unity, diversity, colonialism, and culture change. *Sub-Saharan Africa:* Study of Sub-Saharan economy, society, and culture from precolonial times to the present. *South Asia:* Emphasis on India, Sri Lanka, and Nepal. Traditional and changing South Asian cultures, including caste, family, economy, and religious traditions of Hinduism and Buddhism. *Southeast Asia:* Geographical, historical, ethnic, and sociocultural factors characteristic of the region. Impact of Indian, Chinese, Islamic, and European civilizations. Analysis of selected indigenous social, political, economic, and religious institutions. *Oceania:* Study of the economy, society, religion, art, and ideology of Pacific Island cultures from precolonial times to the present. 4 cr.

501. WORLD PREHISTORY
A) North America; B) Mesoamerica; C) South America; D) Near East; E) Other.

The development of prehistoric culture in various areas of the world. Offered in the following sections as staff is available and student needs dictate.

North America: Archaeology of the Indians north of Mexico from earliest evidence of settlement to European contact. Diversity of cultures from ecological and evolutionary perspectives. Emphasis on the Eastern Woodlands, the Plains, and the Southwest. *Mesoamerica:* Cultural development from earliest cultures through the Spanish conquest. Emphasis on origins of agriculture and rise of Olmec, Teotihuacan, Maya, Toltec, and Aztec civilizations. Stress on factors critical to the development of complex societies. *South America:* Cultural development from earliest migrations through Inca Empire. Focus on major regions of South America. Consideration of Intermediate Area, Amazon Basin, and Central Andes as core regions for foundations of civilization. *Near East:* From earliest cultures to the development of agriculture and settled village life. Examines the processes that gave rise to the world's first civilizations. 4 cr.

512. INTRODUCTION TO WORLD ETHNOGRAPHY
Primarily for majors and minors, but open to all students. Historical and geographic factors, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Analysis of selected peoples in the major ethnographic areas. 4 cr.

514. METHOD AND THEORY IN ARCHAEOLOGY
Basic method and theory; techniques in recovering and interpreting data; laboratory exercises in ceramic and lithic analysis. Critical evaluation of archaeological literature. Prereq: Anth 412 or permission. 4 cr.

515. ANTHROPOLOGY AND CONTEMPORARY ISSUES
Anthropological approaches to current world issues such as racism, poverty, religious movements, revolution, and environmental stress. Selected topics examined in the context of both western and nonwestern societies. 4 cr.

516. KINSHIP AND SOCIAL ORGANIZATION
The significance of kin and nonkin relations in human societies. Topics include the origins and evolution of human society, variations in the form and functions of marriage, family, and kin-based groups and selected nonkin relationships. Primary focus will be on nonindustrial societies. Prereq: Anth 411 or permission. 4 cr.

517. INTRODUCTION TO ANTHROPOLOGICAL ANALYSIS
Basic skills of reading, writing, and analysis essential to the study of anthropology. Focus on learning to recognize, compare, and evaluate critically the central arguments of several major books drawn from different subfields and orientations in anthropology. Small class size for extensive discussion and feedback. Prereq: Anth 411 or 412; /or permission.

518. HISTORY OF ANTHROPOLOGICAL THEORY
Reading and discussion of the works of major theoreticians of American, British, and French schools. Selections from the works of Spencer, Morgan, Tylor, Boas, Kroeber, Lowie, Steward, White, Durkheim, Mauss, Lévi-Strauss, Malinowski, Radcliffe-Brown, Evans-Pritchard, and others are treated in terms of their contributions to the historical development of anthropology and their relevance to contemporary debates in anthropological theory. 4 cr.

519. SOCIAL CHANGE AND DEVELOPMENT: AN ANTHROPOLOGICAL PERSPECTIVE
Extraordinary growth of European and American economic and political power since 1450. Major social, cultural, and economic changes resulting from this growth, described from the anthropological literature for the developing world. Existing theories reviewed in terms of their ability to explain these changes. 4 cr.

614. ECONOMIC ANTHROPOLOGY
Economics of nonindustrial societies; definition of economics; production, distribution, and consumption in selected societies; development. Prereq: Anth 411 or permission. 4 cr.

616. ANTHROPOLOGY OF RELIGION
Major anthropological theories of religion; analysis of religious beliefs as symbolic systems and their interrelations with ritual and other social institutions. Detailed study of specific religions. Prereq: Anth 411 or permission. 4 cr.

618. POLITICAL ANTHROPOLOGY
Political processes and structures in nonindustrial societies. Major topics: centralization of power and authority, legal systems, and warfare. Prereq: Anth 411 or permission. 4 cr.

625. FEMALE, MALE, AND SOCIETY
A critical, cross-cultural study of sex-related behavior in historical as well as contemporary perspective. Draws on anthropological, social-psychological, and sociological literature. Prereq: Anth 411 or Soc 400; /or permission. 4 cr.

630. ANTHROPOLOGICAL FIELD RESEARCH
Explores in theory and practice a range of approaches to doing field studies in anthropology. Techniques such as life histories, questionnaires, projective tests, participant observation, and field diaries will be explored in class and through active participation in a class research project. Prereq: Anth 411; one 500-level or higher anthropology course; /or permission. 4 cr.

697. SPECIAL TOPICS IN ANTHROPOLOGY
A) Social Organization; B) Economic Anthropology; C) Anthropology of Religion; D) Political Anthropology; E) Development; F) Cultural Ecology; G) Prehistoric Archaeology; H) Historic Archaeology; I) Cultural Resources Conservation; J) Lithic Analysis; K) Ceramic Analysis; L) Faunal Analysis; M) Human Evolution; N) Human Variation; O) Nomads; P) Marxist Anthropology; Q) Symbolic Anthropology; R) Women in Development; S) Other. New or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions on file in department office during registration. Prereq: Anth 411 or 412 (as appropriate); /or permission. 4 cr.

699. SENIOR THESIS
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors

candidates. Contact staff to obtain approval and arrange supervision. Should be taken next-to-last semester before graduation. 4 cr.

714. CASTE, CLASS, AND COLONIALISM
Peasants, urban communities, race and ethnicity, stratification, local-national integration, the effects of colonialism, modernization, and social change. Prereq: Anth 411 or permission.

731, 732. AREA STUDIES IN ARCHAEOLOGY
A) South America; B) Mesoamerica; C) North America; D) Other. Offered as staff is available and student needs dictate. Prereq: Anth 412; Anth 514; /or permission. 4 cr.

750. MIDDLE EAST: ISSUES OF ETHNICITY, WORK, AND IDENTITY
Community studies approach to such topics as: ethnicity and identity in the interrelationship of language, religion, and corporate membership in a community; ethnic division of labor; work, pluralism, and family networks; mobility and immobility; estates vs. classes. (Also offered as Soc 750.) 4 cr.

770. CULTURE, PERSONALITY, AND SOCIETY
A cross-cultural view of the development of personality as emergent from genetic, situational, and socio-cultural determinants; analysis of the dynamic interplay of socio-cultural and psychological behavior systems. Prereq: prior courses in sociology, anthropology, or psychology. (Also offered as Soc 770.) 4 cr.

795, 796. READING AND RESEARCH IN ANTHROPOLOGY
A) Cultural/Social Anthropology; B) Anthropological Linguistics; C) Archaeology; D) Physical Anthropology. Prereq: 12 credits of anthropology; permission. Variable (normally 2–8) cr.

797. ADVANCED TOPICS IN ANTHROPOLOGY
Advanced or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions on file in department office during registration. A) Social Organization; B) Economic Anthropology; C) Anthropology of Religion; D) Political Anthropology; E) Social Impact Analysis; F) Cultural Ecology; G) Prehistoric Archaeology; H) Historic Archaeology; I) Cultural Resources Conservation; J) Lithic Analysis; K) Ceramic Analysis; L) Faunal Analysis; M) Human Evolution; N) Human Variations; O) Anthropological Theory. Prereq: Anth 411 or 412 (as appropriate); /or permission. 4 cr.

Sociology (Soc)

(For program description, see page 35.)

400. INTRODUCTORY SOCIOLOGY
Human social and cultural relationships as revealed in customs and institutions. Social theory, methods and techniques of research, and current research findings. Laboratory-problem method of instruction is offered occasionally; students interested should register for the section identified as "Laboratory" in the *Time and Room Schedule*. 4 cr.

500. INTRODUCTION TO SOCIAL PSYCHOLOGY
Social structure and culture, and human behavior. Sociological analysis of behavior in interpersonal relationships, small groups, formal organizations, and other social units. Social psychological issues within various institutions of society. 4 cr.

502. STATISTICS
Elementary applied statistical techniques; tables, graphs, cross-classifications; central tendency and dispersion; correlation and linear regression; confidence intervals and hypothesis testing. 4 cr.

520. THE FAMILY
An anthropological and institutional approach comparing societal customs and organizations. Laboratory-problem method of instruction is offered occasionally; students interested should register for the section identified as "Laboratory" in the *Time and Room Schedule*. 4 cr.

530. RACE AND ETHNIC RELATIONS
Majority-minority group relations; special attention to nature and results of Black-White and ethnic group relations in the United States. 4 cr.

540. SOCIAL PROBLEMS
Relation of customs and institutions to crime, delinquency, alcoholism, physical and mental disease, sexual aberrations, poverty, old age, broken families, and racial and religious prejudices. Especially for nonmajors. 4 cr.

560. RURAL-URBAN SOCIOLOGY
Application of sociological and social psychological principles to the study of populations at various points on the rural-urban continuum. 4 cr.

599. CRITICAL ANALYSIS IN SOCIOLOGY
Basic skills essential to the study of sociology; development of critical reading of sociological literature through the practice of systematic evaluation of evidence and the process of theory construction; written and oral analysis of sociological classics; use of library resources. Required of sociology majors; open to other interested students. 4 cr.

600. SOCIAL INSTITUTIONS
Relationships among education, religion, economy, government, paedotrophic and inter-sex practices, art, and recreation. Cross-cultural approach. 4 cr.

601. METHODS OF SOCIAL RESEARCH
Cross-sectional and longitudinal survey design; direct and indirect measurement techniques; design of field and laboratory experiments; special topics. Prereq: major in sociology or social service; /or permission. 4 cr.

611. HISTORY OF SOCIAL THEORY
Analysis of the writings of major contributors to the development of sociological theory from Plato to Max Weber. Special emphasis given to works of Marx, Weber, and Durkheim. 4 cr.

612. CONTEMPORARY SOCIOLOGICAL THEORY
Major schools, concepts, and issues in present-day sociological theory. Readings on functionalism, conflict theory, systems theory, critical theory, and hermeneutics. Prereq: Soc 611. 4 cr.

615. INTRODUCTORY CRIMINOLOGY
Scientific study of causes and control of crime. Indexes, rates, theories of crime and delinquency, police, courts, probation, prison, and parole. 4 cr.

620. STUDIES IN SOCIAL PSYCHOLOGY
Application of basic concepts of social psychology to a series of studies involving theoretical, methodological, and substantive issues. Prereq: Soc 500. 4 cr.

629. SMALL GROUPS
Interaction among individuals in small groups and between small groups; perception, attitude, and behavior. Analytical techniques are applied. A prior course in social psychology is recommended. 4 cr.

635. MEDICAL SOCIOLOGY: ORGANIZATION AND PROCESSES OF MODERN MEDICINE
Interrelationship of health, medicine, and society; the social construction of wellness, illness, and healing; age, sex, class, and ethnicity in medical care; institutional networks and the social control functions of medicine; roles and relations of physicians, patients, nurses, and other health workers; medicine in a cross-national context. 4 cr.

642. INTRODUCTION TO SOCIAL POLICY
Definition of social policy. Role of the social scientist in social policy research. Sociological research for policy decisions. Research examples in specific policy areas. Utilization of sociological research in policy decisions. 4 cr.

699. SENIOR THESIS
Independent work in the library or field; recommended for, but not confined to, majors intending to pursue graduate studies; required for honors candidates. Contact staff to obtain approval and arrange supervision from two faculty members. Should be taken next-to-last semester before graduation. 4 cr.

715. SOCIOLOGY OF CRIME AND JUSTICE
Seminar devoted to analyses of the relationships between violent, property, and "victimless" crime on the one hand and the police, judicial, and correctional components of criminal justice systems on the other. Prereq: Soc 615 or permission. 4 cr.

720. CURRENT DEVELOPMENT IN SOCIOLOGY OF THE FAMILY
A current topic will be selected each semester, such as stratification and the family, intrafamily communication, power structure of the family, kinship in modern societies. Critical review of the literature; class or individual research project usually will be carried out. Prereq: 8 credits of sociology; Soc 520 recommended. 4 cr.

721. FAMILY INTERACTION
Analysis of family interaction from a sociological perspective. Consideration of individual family members, relationships, and the family as a unit using a social systems approach. Prereq: Soc 400 or permission. 4 cr.

735. COMPLEX ORGANIZATIONS
Comparative study of the structure and dynamics of complex, formal organizations (business, military, political, governmental, educational, medical): power and social control; organizational processes, performances, and effectiveness; impact on persons and societies. Prereq: permission. 4 cr.

740. CULTURE CHANGE
Various types of society; development of theory. Descriptive studies of institutional as well as theoretical materials selected from the writings of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. 4 cr.

741. SOCIAL CHANGE AND SOCIETAL DEVELOPMENT
Comparative, interdisciplinary approach. Interrelationships among economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prereq: permission. Soc 740 recommended. 4 cr.

745. SOCIAL STRATIFICATION
Pattern of distribution of economic, honorific, and political variables within the populations of complex societies; allocation of personnel to the roles in question, notably through occupational mobility; and the impact of such processes upon behavior, both individual and social. Prereq: Soc 400 or 600. 4 cr.

750. MIDDLE EAST: ISSUES OF ETHNICITY, WORK, AND IDENTITY
Community studies approach to such topics as: ethnicity and identity in the interrelationship of language, religion, and corporate membership in a community; ethnic division of labor; work, pluralism, and family networks; mobility and immobility; estates vs. classes. (Also offered as Anth 750.) 4 cr.

757. SOCIAL INSTITUTIONS OF LATIN AMERICA AND THE CARIBBEAN
Selective analysis of distinctive institutions and social systems, with particular attention to social aspects of the process of modernization. Prereq: permission. 4 cr.

761. POPULATION DYNAMICS
Major population trends including changes in birth and death rates, population characteristics, mobility, migration, world population growth, population problems, and policies of countries at different stages of economic development. Interrelationship of population and society. 4 cr.

770. CULTURE, PERSONALITY, AND SOCIETY
A cross-cultural view of the development of personality as emergent from genetic, situational, and socio-cultural determinants; analysis of the dynamic interplay of socio-cultural and psychological behavior systems. Prereq: prior courses in sociology, anthropology, or psychology. (Also offered as Anth 770.) 4 cr.

780. SOCIAL CONFLICT
Nature, setting, and initiation of social conflict, its dynamics, and factors affecting its course and outcome. Prereq: permission. 4 cr.

785. THE STUDY OF WORK
Understanding society through the structure of work. Case studies, in an ethnographic manner, of high-status and low-status occupations to provide understanding of social processes and interrelationships in the social structure. 4 cr.

790. APPLIED SOCIOLOGY
1) Current level of use of sociological knowledge; 2) the advocate, consultant, and researcher roles in

applied settings; 3) techniques of applied research; 4) implications of applied sociology, including ethical problems. Each student will focus on a social problem and write a paper covering the above issues. Applied projects where possible. Prereq: meth of soc res. 4 cr.

794. EVALUATION OF SOCIAL PROGRAMS
Evaluation research defined: purposes of evaluation; design of evaluation studies; setting of programs; utilization of evaluation results. Examination of case studies of evaluations of social programs. Students are responsible for designing an evaluation study in their chosen substantive area. Prereq: meth of soc res. 4 cr.

795, 796. READING AND RESEARCH IN SOCIOLOGY
A) Communications; B) Criminology; C) Culture Change; D) Culture and Personality; E) Deviant Behavior; F) Family; G) Population; H) Rural-Urban; I) Social Control; J) Social Differentiation; K) Social Movements; L) Social Psychology; M) Social Research; N) Social Theory. Prereq: 12 credits of sociology or permission. 2-8 cr.

797. SPECIAL TOPICS IN SOCIOLOGY
A) Criminal Justice Field Work; B) Sociology of Crime and Justice; C) Sociology of Mental Health and Illness; D) Illness and Society; E) The Holocaust; F) Socio-Linguistics; G) Social Class and Family Patterns; H) Measurement in Sociology; I) Violence in the Family; J) Post-Industrial Society; K) Political Sociology; L) Bio-Sociology; M) Social Evolution; N) Social Differentiation; O) Modernization; P) Blacks in the Americas; Q) Religious Movements; R) American States and Regions. New or specialized courses presenting material not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Course descriptions and prerequisites on file in department office during registration. 4 cr.

Soil Science

(See Forest Resources.)

Spanish and Classics

CHAIRPERSON: Warren H. Held, Jr.
PROFESSORS: Richard J. Callan, R. Alberto Casás, Warren H. Held, Jr., Charles H. Leighton
ASSOCIATE PROFESSORS: F. William Forbes, Bernadette Komonchak, John C. Rouman, Barbara H. Wing
ASSISTANT PROFESSORS: Richard V. Desrosiers, Jeanne G. Kurtz
INSTRUCTORS: Maria N. Fernández, Alan D. Haley, Alan J. Stegmayer
LECTURERS: David M. Jeuda, Elisa F. Stoykovich

Classics (Clas)

(For program description, see page 28.)

411-412. ELEMENTARY HITTITE
Elements of grammar, reading of simple prose. 4 cr.

501. CLASSICAL MYTHOLOGY
Survey of the myths and sagas of ancient Greece and Rome. No classical preparation necessary. Background course for majors in English, the arts, music, history, classics, etc. One session weekly devoted to related art and music. 4 cr.

502. HELLENIC AND ROMAN INSTITUTIONS
Lecture, discussion. Introduction to ancient Greek and Roman literature. Emphasis on the institutions from the earliest period to the end of the classical age. Open to all students. 4 cr.

506. INTRODUCTION TO COMPARATIVE AND HISTORICAL LINGUISTICS
Major language families (primarily Indo-European) and the relationships among languages within a family. Diachronic studies; methods of writing; linguistic change; glottochronology; etymological studies. Some language training and Ling 505 desirable. (Also offered as Ling 506.) 4 cr.

511. MAJOR GREEK AUTHORS IN ENGLISH
Major classical authors such as Homer, the Tragedians of Athens, Herodotus, Thucydides, and Plato in the context of their civilization, from which so much of our contemporary culture derives. For students unprepared to read Greek. Background for majors in English, history, Latin, Greek, the arts, music, philosophy, modern languages, etc. Open to all students. 4 cr.

512. MAJOR LATIN AUTHORS IN ENGLISH
Major classical authors such as Plautus, Terence, Cicero, Catullus, Vergil, Ovid, Seneca, Juvenal, and Tacitus in the context of their civilization, from which so much of our contemporary culture derives. For students unprepared to read Latin. Background for majors in English, philosophy, history, Latin, Greek, the arts, music, modern languages, etc. Open to all students. 4 cr.

521, 522. MASTERPIECES OF GRECO-ROMAN CULTURE IN ENGLISH
More advanced study of the writings of classical civilization centered on a single theme and taught in the Socratic method. For students with some classical preparation, although no knowledge of the Greek and Latin languages is required. Background for prelaw students as well as majors in English, history, Latin, Greek, modern languages, and political science. 4 cr.

525. GREEK AND LATIN ORIGINS OF MEDICAL TERMS
A study of medical terminology. Exercises in etymology and the development of vocabulary in a context at once scientific, historical, and cultural. No knowledge of Greek or Latin is required. Useful to premedical, predental, preveterinary, nursing, medical technology, and other students in the biological and physical sciences. Open to all students. 4 cr.

595, 596. TOPICS IN CLASSICS
Introduction and elementary study related to linguistic study of Latin and Greek or relevant to Greco-Roman culture and history. Primarily for students unprepared to read Latin and Greek. Topics: A) Byzantine Heritage; B) Grammar: Comparative Study of English and the Classical Languages; C) Greek and Latin Origins of Legal Terms; D) Greek and Latin Origins within the English Language; E) Classical Backgrounds of Modern Literature; F) Sanskrit; G) Classical Archaeology. 2 or 4 cr.

695, 696. SPECIAL STUDIES IN CLASSICS
Advanced work in classics. Research paper. Not open to freshmen and sophomores. 2 or 4 cr.

Greek (Grek)

(For program description, see page 31.)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if a student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY GREEK
Grammar, simple composition, and translation. (No credit for students who have had two or more years of Greek in secondary school; however, any such students whose studies of Greek have been interrupted for a significant period of time should consult the section supervisor about possibly receiving credit.) 4 cr.

403-404. ELEMENTARY MODERN GREEK
Aural-oral practice and the study of fundamental speech patterns, reading, and writing to achieve a firm basis for an active command of the language. Lab. 4 cr.

503-504. INTERMEDIATE GREEK
Readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prereq: Grek 402. 4 cr.

505-506. INTERMEDIATE MODERN GREEK
Short selections from modern Greek literature with grammar review and oral practice. Readings from such authors as Solomos, Cavafy, Palamas, Kazantzakis, Venezis, Myrivilis, Seferis, and Elytis. Prereq: Greek 404 or equivalent. Lab. 4 cr.

631-632. GREEK PROSE COMPOSITION
Review of Attic Greek grammar; study of Greek prose style; English to Greek translation. Prereq: permission. 4 cr.

751, 752. HOMER AND THE ARCHAIC PERIOD
Readings from the *Iliad*, the *Odyssey*, the Homeric hymns, Hesiod, Pindar, and the lyric poets. Prereq: permission. 4 cr.

753, 754. ADVANCED STUDIES IN ATHENIAN LITERATURE
A) Aeschylus; B) Sophocles; C) Euripides; D) Aristophanes; E) Herodotus; F) Thucydides; G) Xenophon; H) Plato; I) Aristotle; J) Lysias; K) Demosthenes; L) Isocrates. Major Attic authors from the Battle of Marathon to the death of Alexander the Great. Prereq: permission. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795, 796. SPECIAL STUDIES IN GREEK
A) Pre-Socratic Philosophers; B) Hellenistic Greek Authors; C) Menander; D) Callimachus; E) Apollonius of Rhodes; F) Theocritus; G) Polybius; H) Greek Authors of the Roman Empire; I) Plutarch; J) Septuagint; K) New Testament; L) Greek Church Fathers; M) Byzantine Authors; N) Spoken Greek; O) Advanced Greek Composition; P) Introduction to Classical Scholarship; Q) Greek Epigraphy; R) Greek Dialects; S) Comparative Grammar of Greek and Latin; T) Homer: A Linguistic Analysis; U) Greek Institutions; V) Palaeography and Textual Criticism. Topics selected by instructor and student in conference. Prereq: permission. 2 or 4 cr.

Latin (Latn)

(For program description, see page 31.)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level courses in foreign languages if a student has had two or more years of the foreign language in secondary school.

401-402. ELEMENTARY LATIN
Elements of grammar, reading of simple prose. Course cannot be counted for major credits. (No credit for students who have had two or more years of Latin in secondary school; however, any such students whose studies of Latin have been interrupted for a significant period of time should consult the section supervisor about possibly receiving credit.) 4 cr.

501. REVIEW OF LATIN
Intensive review of Latin grammar and vocabulary. Designed primarily for those whose study of Latin has been interrupted for a year or more and for those who have had only two years of high school Latin. 4 cr.

503-504. INTERMEDIATE LATIN
Review. Readings from Cicero, Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prereq: Latn 402 or equivalent. 4 cr.

631-632. LATIN PROSE COMPOSITION
Grammar review; study of Latin prose style; English to Latin translation. Prereq: permission. 4 cr.

751, 752. CICERO AND THE ROMAN REPUBLIC
Prereq: permission. 4 cr.

753, 754. ADVANCED STUDIES IN THE LITERATURE OF THE GOLDEN AGE
A) Lucretius; B) Catullus; C) Caesar; D) Sallust; E) Vergil; F) Horace; G) Tibullus; H) Propertius; I) Ovid; J) Livy. Major Roman authors from the dictatorship of Sulla to the death of Augustus. Prereq: permission. 4 cr.

755, 756. ADVANCED STUDIES IN THE LITERATURE OF THE SILVER AGE
A) Seneca the Younger; B) Persius; C) Petronius; D) Lucan; E) Statius; F) Quintilian; G) Martial; H) Juvenal; I) Tacitus; J) Pliny the Younger. Major Roman authors from the reign of Nero to the death of Trajan. Prereq: permission. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING
Objectives, methods, and techniques in teaching

foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795, 796. SPECIAL STUDIES IN LATIN
A) Minor Authors of the Republic; B) Plautus; C) Terence; D) Minor Authors of the Empire; E) Suetonius; F) Latin Church Fathers; G) Medieval Latin; H) Advanced Latin Composition; I) Introduction to Classical Scholarship; J) Latin Epigraphy; K) Italic Dialects; L) Comparative Grammar of Greek and Latin; M) Roman Law. Topics selected by instructor and student in conference. Prereq: permission. 2 or 4 cr.

Portuguese (Port)

401-402. ELEMENTARY PORTUGUESE
For students without previous knowledge of Portuguese. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of the language. Labs. No credit toward a major. (No credit for students who have had two or more years of Portuguese in secondary school; however, any such students whose studies of Portuguese have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 4 cr.

503-504. INTERMEDIATE PORTUGUESE
Conversation and composition based on readings in contemporary Portuguese and Brazilian literature, especially theater, which is closest to conventional language. A traditional grammar text supplements reading. Lab. 4 cr.

Spanish (Span)

(For program description, see page 36.)

New students will be assigned to the proper course on the basis of their scores on the College Board Achievement Test. Transfer credit will not be given for elementary-level college courses in foreign languages if a student has had two or more years of the foreign language in secondary school. No student educated in a foreign country or for whom Spanish is the native tongue will be permitted to register for any Spanish course numbered 650 or below. All courses conducted in Spanish (or Portuguese) except where noted.

401-402. ELEMENTARY SPANISH
For students without previous knowledge of Spanish. Aural-oral practice; fundamental speech patterns; reading and writing to achieve a firm basis for an active command of Spanish. Labs. No credit toward a major. (No credit for students who have had two or more years of Spanish in secondary school; however, any such students whose studies of Spanish have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) A) Human Services. 4 cr.

407. ACCELERATED SPANISH
Span 401-402 in one semester. Study of fundamental speech patterns, reading and writing to achieve a firm basis for active command of Spanish. Labs. Previous knowledge of Spanish is not required. (No credit for students who have had two or more years of Spanish in secondary school; however, any such students whose studies of Spanish have been interrupted for a significant period of time should consult the section coordinator about possibly receiving credit.) 8 cr.

501. REVIEW OF SPANISH
Emphasis on aural-oral practice; review of basic structure; reading and writing to develop active command of the language. Labs. Designed for those whose study of Spanish has been interrupted for a significant amount of time and for those who have had only two years of high school Spanish. 4 cr.

503-504. INTERMEDIATE SPANISH
Complete literary texts of intellectual worth; review of language structure; oral and written expression of ideas. Discussion and papers in Spanish. Labs. Open to students who have passed Span 402 with a C (2.00). No credit toward the major. 4 cr.

525. SPANISH CIVILIZATION AND CULTURE
Historical, geographical, and artistic expressions of Spanish civilization that have formed the character of contemporary Spanish culture. Readings, slides, films, tapes, and records. Conducted in English. Majors must take either 525 or 526, but both may not be counted for major credit. 4 cr.

526. LATIN AMERICAN CIVILIZATION AND CULTURE
Significant historical, geographical, and artistic expressions of pre-Colombian and Latin American civilization. Readings, slides, films, tapes, records. Conducted in English. Majors must take either 525 or 526, but both may not be counted for major credit. 4 cr.

601. SPANISH PHONETICS
Practical application of fundamental phonetic theory to spoken Spanish. Required of Spanish majors. 4 cr.

621. SPANISH AND PORTUGUESE LITERATURE IN TRANSLATION
Major works by principal authors, such as: Camões, Cervantes, Lope de Vega, Calderón, Eça de Queiroz, Unamuno, Ortega y Gasset, García Lorca, Casona, etc. Readings, discussions, papers in English. Does not count for Spanish major. 4 cr.

622. LATIN AMERICAN AND BRAZILIAN LITERATURE IN TRANSLATION
Major works by principal authors, such as: Inca Garcilaso, Díaz del Castillo, Machado de Assís, Borges, Asturias, Neruda, E. Veríssimo, Fuentes, Leñero, Guimarães Rosa, and Jorge Amado. Readings, discussion, papers in English. Does not count toward Spanish major. 4 cr.

631, 632. ADVANCED SPANISH CONVERSATION AND COMPOSITION
To maintain and perfect written and spoken Spanish through intensive classroom work, individual conferences, and laboratory sessions. Prereq: Span 504 or equivalent. 4 cr.

One course from Span 650, 651, 652, 653, 654 (or an equivalent course) is prerequisite to all higher literature courses in Spanish.

650. INTRODUCTION TO CRITICAL ANALYSIS
Methods and practice of literary criticism. Critical analysis of representative essays, fiction, poetry,

and drama from Spain and Latin America. Frequent short papers. Required of Spanish majors; should be taken concurrently with or immediately following Spanish 632. 4 cr.

651, 652. INTRODUCTION TO SPANISH LITERATURE AND THOUGHT
Reading and analysis of major works within the historical, cultural, and social background of the Iberian peninsula. Papers, discussion, and examinations in Spanish. Prereq: Span 631, 632. May be taken concurrently with Span 632 with permission of adviser. 4 cr.

653, 654. INTRODUCTION TO LATIN AMERICAN LITERATURE AND THOUGHT
Reading and analysis of major works within the historical, cultural, and social background of the New World. Papers, discussion, and examinations in Spanish. Prereq: Span 631, 632. May be taken concurrently with Span 632 with permission of adviser. 4 cr.

685, 686. STUDY ABROAD
Studies at a Spanish or Latin American university. Prereq: primarily for juniors and seniors who have passed Span 503-504 or equivalent with grade of B (3.00) or better. Noncredit orientation meetings required during semester prior to departure. Interested students should consult with the program directors. Variable to 16 cr.

691, 692. READINGS IN CURRENT PERIODICALS
Advanced practice in reading, speaking, and writing, based on current events in contemporary periodicals of the Spanish-speaking world. Co- or prereq: Span 632 or equivalent. May be repeated. 2 cr.

733. HISTORY OF THE SPANISH LANGUAGE
Evolution of the Spanish language from the period of origins to the present. 4 cr.

752. DRAMA AND POETRY OF THE SIGLO DE ORO
Social and historical background of the baroque period. Representative plays of Lope de Vega, Tirso de Molina, Calderón; lyric poetry of Lope, Góngora, and Quevedo; prose developments. Prereq: Span 652 or 654 or equivalent. 4 cr. (Not offered every year.)

754. CERVANTES
Cervantes's literary art. Selections from the major works. The Quijote, its originality and significance; its antecedents; its religious, philosophical, and sociological aspects; and its artistic structure. Prereq: Span 652 or 654 or equivalent. 4 cr. (Not offered every year.)

755. LITERATURE OF THE 19th CENTURY
Larra, Espronceda, Bécquer, Pérez Galdós, and Blasco Ibáñez. Romanticism, realism, and naturalism. Prereq: Span 652 or 654 or equivalent. 4 cr. (Not offered every year.)

757. THEATER AND POETRY OF THE 20th CENTURY
The Generation of 1898 and Modernismo: Lorca, Casona, Buero Vallejo, Sastre, Salinas, Guillén, and Miguel Hernández. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

758. SPANISH PROSE OF THE 20th CENTURY
Novels, short stories, and essays. Unamuno, Baroja, Menéndez Pidal, Ortega y Gasset, Julián Marías, Aranguren, Pérez de Ayala, Gironella, and Cela; survey of contemporary prose. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

760. UNAMUNO AND ORTEGA Y GASSET
Philosophical ideology and literary content of major contributions of Miguel de Unamuno and José Ortega y Gasset. Prereq: Span 652, 654, or equivalent; /or permission. 4 cr. (Not offered every year.)

771. LATIN AMERICAN DRAMA
From pre-Hispanic origins to the present, modern playwrights of Mexico and Puerto Rico. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

772. LATIN AMERICAN NOVEL
Development from romanticism to the present; contemporary trends and techniques. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

773. LATIN AMERICAN SHORT STORY
Representative authors; stress on 20th century. Principles of interpretation. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

774. MAJOR LATIN AMERICAN AUTHORS
Works and lives of selected writers; pertinent historical circumstances. Prereq: Span 652, 654, or equivalent. 4 cr. (Not offered every year.)

790. GRAMMATICAL STRUCTURE OF SPANISH
An overview of the grammatical structure of Spanish through an in-depth analysis of both morphology and syntax, with emphasis given to the meaningful contrasts that exist within the Spanish language and to grammatical contrasts between Spanish and English. 4 cr.

791. METHODS OF FOREIGN LANGUAGE TEACHING
Objectives, methods, and techniques in teaching foreign languages from elementary grades through college. Discussion, demonstration, preparation of instructional materials, microteaching of the language skills. Prereq: permission. 4 cr.

795. SPECIAL STUDIES IN SPANISH LANGUAGE AND LITERATURE
B) Medieval Spanish Literature; C) Spanish Literature of the Renaissance; D) Spanish Literature of the Golden Age; E) Spanish Literature of the 18th and 19th Centuries; F) Spanish Literature of the 20th Century (1898-1936); G) Contemporary Spanish Literature; H) Latin American Literature of the 16th and 17th Centuries; I) Latin American Literature of the 18th and 19th Centuries; J) Latin American Literature of the 20th Century; K) Contemporary Latin American Literature; L) Structural and Applied Linguistics; M) Spanish Literary Criticism; N) Latin American Essay; O) Latin America; P) Catalán; Q) Spanish Poetry; R) Latin American Poetry; S) Galdós; T) Archetype Latin American Literature; U) Special Teaching Problems; V) Spanish Civilization and Culture; W) Latin American Civilization and Culture; X) Borges; Y) Spanish Theater; Z) Spanish for

Graduates. Guided study with training in bibliography and organization of material. Topics selected by instructor and student in conference. Prereq: permission of the major supervisor. 2 or 4 cr.

796. SPECIAL STUDIES IN SPANISH LANGUAGE AND LITERATURE
A) Hispanic Minorities of the United States; B) Hispanic Film; C) Introduction to Hispanic Linguistics; D) Hispanic Dialectology. Guided study with training in bibliography and organization of material. Topics selected by instructor and student in conference. Prereq: permission of the major supervisor. 2 or 4 cr.

Technology (Tech)

Otis J. Sproul, Dean

The following courses are not necessarily offered every year.

564. FUNDAMENTALS OF CADD/CAE/CIM
Fundamentals of CADD/CAE/CIM; graphics workstation techniques and principles. Topics covered include: display functions; graphics construction techniques; entity manipulation; symbol libraries; variational geometry; and solids modeling. Prereq: permission. 3 cr.

583. TECHNOLOGY SYSTEMS
Study of the requirements, limitations, benefits, and hazards that are constraints on the development of technological systems. Prereq: prior courses in physics or chemistry and algebra II at high school level; sophomore or higher standing at UNH. 4 cr.

650. COOPERATIVE WORK EXPERIENCE
Course required of all students participating in the College of Engineering and Physical Sciences Cooperative Program during employment semesters. Prereq: permission. 0 cr. Cr/F.

697. OCEAN PROJECTS
Students work as members of interdisciplinary project teams on contemporary ocean-related problems under the guidance of a faculty adviser. Student team defines problem, prepares a budget, conducts literature surveys, engages in dialogue with experts in the ocean community, deals with vendors, designs and builds a working engineering model, gathers and analyzes scientific data or conducts a comprehensive study, makes interim reports, and defends its results before a jury of experts. Prereq: normally senior standing and permission of the course director. A year-long course: 2 credits each semester, 4 credits total, and "IA" grade (continuous course) given at the end of the first semester. 4 cr.

Theater and Communication (ThCo)

CHAIRPERSON: Jean M. Brown
PROFESSORS: Joseph D. Batcheller, John C. Edwards
ASSOCIATE PROFESSORS: Jean M. Brown, Carol Lucha Burns, Gilbert B. Davenport, David J. Magidson, Joshua Meyrowitz, Charles L. Robertson, Wilburn L. Sims
ASSISTANT PROFESSORS: Raymond J. Bernier, John Lannamann, Gina Marchetti, Sheila McNamee, Lawrence J. Prelli
FACULTY IN RESIDENCE, ASSISTANT PROFESSORS: Ian Angus, Melenda M. Pomykal
INSTRUCTOR: Gay Nardone
FACULTY IN RESIDENCE: Donald Charles Smith

Communication

(For program description, see page 28.)

402. COMMUNICATION AND SOCIAL ORDER
Introduction to human communication from a broad liberal arts perspective; issues include the impact of language and communication through the processes of intrapersonal, interpersonal, group, public, and mass communication. Freshman, sophomore priority. 4 cr.

403. PUBLIC SPEAKING
Sensitizes speakers and listeners; understanding and adapting to receivers, idea selection and development, message organization, and delivery. Nonverbal communication. 4 cr.

404. INTRODUCTION TO ARGUMENTATION
Principles of inquiry and advocacy. Philosophical and logical frameworks of argument; analysis, discovery, and testing of data; forms of argument; testing of arguments; patterns of proof. 4 cr.

455. INTRODUCTION TO MASS COMMUNICATION
Nature, development, and effects of mass media. Overview of mass communication history and theory. 4 cr.

501. ARGUMENTATION II
Argument and advocacy as action on minds by means of discourse. Prereq: ThCo 404 or ThCo 405 or permission. 4 cr.

502. INTERPERSONAL LABORATORY
Integrates interpersonal theory and practice in a laboratory setting. Prereq: ThCo 402 and permission. 4 cr.

503. INTRODUCTION TO GROUP PROCESSES
Communication behavior in small groups. Problem-solving procedures, leadership, behavioral patterns, communication interaction patterns. Prereq: ThCo 402 or 403 or permission. 4 cr.

506. PERSUASION
Advanced course on problems of influencing human behavior. Practical applications. Prereq: ThCo 403 or permission. 4 cr.

533. INTRODUCTION TO FILM
Introduction to the art, history, technology, and theory of the narrative motion picture from the silent period to the present. Examination of films by such filmmakers as Griffith, Keaton, Eisenstein, Renoir, Welles, Hitchcock, Bergman, Kurosawa.. (Also offered as Engl 533; students majoring or minoring in communication or in theater must register for ThCo 533.) 4 cr.

556. INTRODUCTION TO TELEVISION PRODUCTION
Theory and actual studio experience, practice, and procedures. All aspects of television work and formats. Students operate every piece of studio equipment and write, produce, and direct several shows. Prereq: ThCo 455 or permission. 4 cr.

560. FILMMAKING
Theory of cinematic construction grounded in production work. Visualization, story-boarding, pictorial composition, creation of filmic reality, narrative devices, and editing. Students produce own short films. Lab fee. Prereq: permission. 4 cr.

567. IMAGES OF GENDER IN THE MEDIA
Portrayal of women and men in a variety of media. Communication research methodologies employed to examine media attempts to persuade, reinforce, and manipulate attitudes. 4 cr.

572. LANGUAGE AND BEHAVIOR
Human symbol-using capacity and effects of language on behavior. Ways in which symbols help create individual realities, reflect levels of personal judgment and adjustment, facilitate or hinder interpersonal communication. Application to verbal and nonverbal communication and contemporary and social issues. 4 cr.

580. BROADCAST NEWS PREPARATION/DELIVERY
Introduction to radio and television news writing, editing, and delivering. Emphasis on practical radio news-writing experience. Prereq: permission. 4 cr.

595. SPECIAL TOPICS IN COMMUNICATION
Individual or group projects primarily in the communication option. By permission and arrangement with appropriate faculty. (May be repeated.) 2, 4, 6, or 8 cr.

602. THEORIES OF INTERPERSONAL COMMUNICATION
Contemporary perspectives on interpersonal communication; analytical emphasis on human communication behavior. Prereq: ThCo 402; at least one 500-level communication course. 4 cr.

603. THEORIES OF GROUP COMMUNICATION
Historical foundations and contemporary perspectives in group communication; analytical emphasis on human communication behavior. Prereq: ThCo 402; at least one 500-level communication course. 4 cr.

608. COMMUNICATION ANALOGS
Pragmatic analysis of communication problems. The level structure of human communication, system interaction and meta-communication, and paradoxes of communication behavior are examined through analogs and axioms of behavior as communication. Prereq: ThCo 402; at least one 500-level communication course. 4 cr.

616. STUDIES IN FILM
Advanced, focused study of the cinema. Topics vary from year to year and with instructor. The focus may range from general considerations of film theory, film criticism, and film history, to specific analyses of selected genres, directors, and periods. (Also offered as Engl 616; students majoring or minoring in communication or in theater must register for ThCo 616.) Prereq: Engl/ThCo 533 or instructor's permission. 4 cr.

630. PSYCHOLOGY OF COMMUNICATION
Focuses on how communication theorists and researchers have translated theories of psychological (internal) motivation into theories of human communication where emphasis is placed on external, observable patterns of action. Prereq: ThCo 402 and at least one 500-level communication course. 4 cr.

632. COMMUNICATION THEORY
Terminology, concepts, theoretical models, functions, levels, modes and media, and role taking in human communication. Prereq: ThCo 402; any 500-level communication course; /or permission. 4 cr.

637. HISTORY AND LAW OF MASS COMMUNICATION
Media regulation discussed in historical/social contexts in which it took place. Begins with movable type and goes through present modes of regulation including executive, FCC, and the courts. Prereq: ThCo 455 and permission. 4 cr. (Offered every other year.)

656. PRINCIPLES OF RHETORICAL CRITICISM
Roles and methods of rhetorical critics. Historical background to rhetorical-critical structures and processes including neo-Aristotelian criticism and Burkeian criticism. Critical principles and practices. Seminar. Prereq: ThCo 403; or permission. 4 cr.

658. MEDIA ANALYSIS AND CRITICISM
Approaches and methodologies for media criticism. Analysis of sample studies. Students work on original media analysis projects. Prereq: ThCo 455; or permission. 4 cr.

673. RESEARCH METHODS IN COMMUNICATION
Focused analysis and comparison of approaches for conducting research in interpersonal, group, and mediated communication. Methods covered include field work, participant observation, empirical methods, and critical analysis. Prereq: permission. (May be repeated.) 4 cr.

683. GENDER AND EXPRESSION
The relationship between the social/cultural paradigm of gender and the existential paradigm of self. Analysis of the social construction of sexuality including language, patterns of dominance, social distribution of knowledge, media influence techniques, and the impact of feminism on these. Prereq: one communication course; one women's studies course; /or permission. 4 cr.

695. COMMUNICATION SEMINAR
An upper-level seminar; variable topics in communication research, theory, and practice. May be repeated for different topics. 4 cr.

747. INTERCULTURAL COMMUNICATION
A course which extends communication generalizations to intercultural problems. Relates concepts, approaches, and analyses of behavior to research and theory in international, cross-cultural, and

comparative communication. Prereq: five communication courses, three of which must have been at the 500-600 level, or permission. 4 cr.

750. WRITING FOR PERFORMANCE
See theater offerings. 4 cr.

771. CRITICISM OF CONTEMPORARY RHETORIC
Applies rhetorical-critical systems and principles. Campaign rhetoric, agitative rhetoric, the rhetoric of religion, the rhetoric of militarism, the rhetoric of diplomacy, and the rhetoric of social movements. Course content variable. Prereq: ThCo 656 or permission. 4 cr.

772. MEDIA THEORY
Seminar. Focused analysis of specific theoretical principles of film, television, radio, and other media. Application to current examples in politics, advertising, and entertainment. Prereq: ThCo 455; ThCo 658; /or permission. 4 cr.

783. THEORIES OF LANGUAGE
Nature, uses, and roles of language. Representative theorists may include Carroll, Piaget, Sapir, Whorf, Vetter, Vygotsky, Weiner, Chomsky, Labov, Steward, Ogden and Richards, Ruesch, and Sullivan. Prereq: permission; or ThCo 572 and 673. 4 cr. (Not offered every year.)

Dance

461. MODERN DANCE I
An introductory course that includes techniques and improvisation as well as lectures in history and theory. 4 cr.

462. BALLET I
Introductory course: technique; historical development of ballet. 4 cr.

463. THEATER DANCE I
Introductory course: techniques; improvisation; lectures on jazz, ethnic, and other theatrical dance forms. 4 cr.

470. THEATER MOVEMENT
Stage movement for actors. Open to theater majors only. 2 cr.

561. MODERN DANCE II
Intermediate-level course that includes techniques and improvisation. Prereq: ThCo 461 or permission. May be repeated for credit. 2 cr.

562. BALLET II
Extension of Ballet I syllabus; emphasis is on technique, with additional step vocabulary. Prereq: ThCo 462 or permission. May be repeated once for credit. 2 cr.

563. THEATER DANCE II
Technique; Afro-Cuban, modern, and East Indian dance; body movement through exercise and combinations involving stretch, strength, and flexibility. Prereq: ThCo 463 or permission. May be repeated once for credit. 2 cr.

576. POINTE
Beginning/advanced beginning course in art of dancing in toe shoes. Focus on technique involved in gaining strength and on methodology for understanding the art of the ballerina. 2 cr. Cr/F.

597. DANCE THEATER PERFORMANCE
Designed for students participating in UNH Dance Theater Company. Skill development through rehearsal and actual performance experience. 2 cr. Cr/F.

633. DANCE COMPOSITION I
Practical, developmental approach to process of creating dances. Prereq: ThCo 561, 562, 563, or permission. 2 cr.

634. DANCE COMPOSITION II
Use of music; group choreography. Prereq: ThCo 633. 2 cr.

638. THE DANCE
Historical and philosophical consideration of dance trends. 4 cr.

640. LABANOTATION
Study and practice of recording human movement by the method of Labanotation. Prereq: permission. 2–4 cr.

661. MODERN DANCE III
Advanced-level course in technique and composition. Prereq: ThCo 561 or permission. May be repeated for credit. 2 cr.

662. BALLET III
Advanced level course in technique; pointe work included. Prereq: ThCo 562 or permission. May be repeated for credit. 2 cr.

663. THEATER DANCE III
Extension of Theater Dance I and II; brings students to a more advanced technical level. Prereq: Theater Dance I and II; or permission. May be repeated for credit. 2 cr.

684. SPECIAL TOPICS IN DANCE
Exploration of topics agreed upon by students and instructor. Topics vary. May be repeated. 2–4 cr.

732. CHOREOGRAPHY
Theoretical and practical consideration of the creative and aesthetic aspects of ballet, modern, and jazz dance. Prereq: ThCo 634 or permission. 4 cr.

Theater

(For program description, see page 36.)

435. INTRODUCTION TO THEATER
Emphasis on modern theater forms; e.g., legitimate, musical, cinema, television. Survey of theater areas, personnel, and methods. Attendance at University Theater and Cultural Events productions. Minimal participation in laboratory and major productions. 4 cr.

436. HISTORY OF THEATER I
History and theory in its social framework from the beginnings to 1800. 4 cr. (Not offered every year.)

438. HISTORY OF THEATER II
1800 to present. 4 cr. (Not offered every year.)

450. HISTORY OF THE AMERICAN MUSICAL
Study of the development of the American musical and its relationship to American social history. 4 cr.

457. ORAL INTERPRETATION
Analysis of literature for performance; demonstration and experimentation with performance methods; development of a critical standard for evaluation of performance and literature. 4 cr.

459. STAGECRAFT
Stage scenery construction and painting. Properties, sound, and backstage organization. Survey of costumes and lighting. Practical application in University Theater productions. 4 cr.

475. STAGE MAKEUP
Fundamentals of juvenile, old age, character, and special stage makeup techniques. Prereq: permission. Lab fee. 2 cr.

520. EDUCATION THROUGH DRAMATIZATION
Application to educational curricula of drama techniques including: sensory awareness, movement, pantomime, story telling, story dramatization; also lesson plan writing. 4 cr.

541. ARTS ADMINISTRATION
Contemporary arts administration; theories and techniques of cultural resource development, organization, structure, labor relations, marketing, consumer behavior, public relations, fund raising, audience development, and long-range planning. 4 cr.

546. STAGE COSTUME DESIGN AND EXECUTION
Costume history, styles, design theory, patternmaking, and construction. Prereq: permission. 4 cr.

547. STAGE PROPERTIES
Research and manufacture of period and modern stage, trim, and hand properties. Prereq: ThCo 459. 4 cr.

548. STAGE LIGHTING DESIGN AND EXECUTION
Elementary electricity, design theory, instrumentation, control, and practice. 4 cr.

549. VOICE AND DICTION I
Based on individual needs; particular reference to theater, television, radio. Individual and group practice sessions. Coreq: ThCo 551. Prereq: permission. 2 cr.

550. VOICE AND DICTION II
Basic skills for oral interpretation, theater, etc., including analysis and development of dialects. Coreq: ThCo 552. Prereq: ThCo 549. 2 cr.

551. ACTING I
Development of fundamental vocal and physical stage techniques for actors and directors through exercises, improvisation, and theater games. Should be taken concurrently with ThCo 549. 4 cr.

552. ACTING II
Application of prior training in ThCo 551 (prerequisite) to building characterizations in scenes and short plays. Should be taken concurrently with ThCo 550. 4 cr.

583. PUPPETRY
The art of puppetry as it applies to classroom dramatics. Students develop skills in hand and rod puppetry; writing and performing. 4 cr.

592. SPECIAL TOPICS IN THEATER
Special topics, problems, or projects in theater. Content varies according to needs and interests of students and faculty. May be repeated for credit. 2–4 cr.

621. CREATIVE DRAMA
Advanced drama techniques leading to the design and execution of drama sessions with children. Includes role-playing, improvisation, and story dramatization. Prereq: permission. 4 cr.

622. STORYTELLING, STORY THEATER, AND INVOLVEMENT DRAMATICS
Students actively develop storytelling techniques based on individual needs. Includes an examination of story theater and involvement styles and the development of the ensemble. 4 cr.

624. MUSICAL AND THEATER FOR YOUTH
Historical examination and analysis. Emphasis on theory and application of playwriting, stage and costume design, acting and directing techniques. Participation in production for youth required. 4 cr.

627. METHODS OF EDUCATION THROUGH DRAMATIZATION
Materials and technique practicum for teaching material in ThCo 520. (Division of Continuing Education only.) Prereq: permission. 2–4 cr.

652. SCENE DESIGN (SCENIC ARTS IV)
Stage drafting, modules, materials, design theory, and styles. Individualized exercises, final project. Prereq: ThCo 459. 4 cr.

653. PERFORMANCE PROJECT
Application of acting and directing theory to assigned responsibilities in a University Theater production or to an individual performance project. Prereq: ThCo 551; 552; permission. To be taken in conjunction with ThCo 654, but not concurrently. May be repeated to 4 cr. 2 cr.

654. SCENIC ARTS PROJECT
Application of experience in design and technical aspects to assigned responsibilities in a University Theater production or to an individual project or presentation. Prereq: ThCo 459; 652; permission. To be taken in conjunction with ThCo 653, but not concurrently. May be repeated to 4 cr. 2 cr.

655. MUSICAL THEATER WORKSHOP
Introduction to performing and directing the American musical. Discussion and application of beginning audition, acting, and staging techniques. Lab. 4 cr.

657. DIRECTING
Continuation of ThCo 552 (prerequisite). The director and performer develop interaction of the character. Ensemble playing. Full directing responsibility for a one-act play. 4 cr.

692. SPECIAL TOPICS IN THEATER
Variable topics in theater research, theory, or performance. May be repeated. 2–4 cr.

693. THEATER MANAGEMENT I
Theater organization, fund raising, public relations, audience development, business and box-office management. Special topics may be explored. Prereq: four courses in theater. 4 cr.

729. COMMUNITY-ORIENTED DRAMA PROGRAMS
Advanced practicum in designing, developing, and producing drama programs for the school and community. 4 cr.

730. THEATER MANAGEMENT II
Theory and technique of theater management applied to a specific assignment; may involve internships with professional, community, or educational theaters. Prereq: ThCo 693. 4 cr.

741. PLAY ANALYSIS FOR PRODUCTION
Analysis and discussion to develop production concepts for actors, technicians, directors, designers, teachers. Prereq: ThCo 435, 436, or 438; either 459, or 551 and 552. 4 cr. (Not offered every year.)

750. WRITING FOR PERFORMANCE
Playwriting; radio, television, and film. Emphasis will vary. Focus on original work with possible performances in other classes. May be taken three times for credit. Prereq: permission. 4 cr.

755. ADVANCED MUSICAL THEATER
Emphasis on characterizations and directing techniques. Use of scripts and scores of representative composers, lyricists, and librettists. Prereq: ThCo 655. Lab. 4 cr.

758. ACTING III
Continuation of ThCo 657 and of the sequence begun in ThCo 551 and 552. Styles of drama for the actor and director. Greek, Shakespearean, 18th-century comedy, and 19th-century realism. Prereq: ThCo 551; ThCo 552; ThCo 657; /or equivalent. 4 cr.

768. CHAMBER THEATER
Choric speaking, reader's theater, chamber theater, and other forms of group interpretation in theory and practice. 4 cr.

781. THEATER WORKSHOP FOR TEACHERS
Intensive seminar-workshop. Rehearsal techniques, theater production, and stage direction; work in lab and in summer repertory theater production as applicable to secondary-school theater. Offered in the summer session. 4 cr.

782. THEATER WORKSHOP FOR TEACHERS
Continuation of ThCo 781 (not a prerequisite). Offered in the summer session. 4 cr.

General

691. LABORATORY OR FIELD EXPERIENCE
Taken in the senior year. 4 cr.

697. SENIOR SEMINAR
Meetings as preparation for senior project; overview of recent developments and trends in the oral communication arts and sciences. Prereq: senior standing. 2 cr.

698. SENIOR PROJECT
Further development and completion of senior project. Prereq: senior standing. 2 cr.

795, 796. INDEPENDENT STUDY
Advanced individual study in one of the three areas of the department. Could be combined with senior project (for majors) for a total of 12 credits in the same semester if the student wishes to study off campus. Project is to be developed with supervising instructor. May be repeated. 1–8 cr.

Vocational/Technical And Adult Education (VTAE)

(For program description, see page 49.)

CHAIRPERSON: Maynard C. Heckel
PROFESSORS: William H. Annis, Maynard C. Heckel
ASSOCIATE PROFESSORS: Gregory D. Gill, Peter J. Horne, David L. Howell, Lewis Roberts, Jr.
THOMPSON SCHOOL ASSOCIATE PROFESSOR: Thomas A. March

440. CONCEPTS OF CAREER EXPLORATION
Examines the four major roles of people and how these roles apply to learning in a university setting. The four roles are: 1) family member; 2) citizen; 3) worker; and 4) user of leisure time. Through this concept of career exploration, students develop skills to: 1) use the concept as a teaching or learning strategy; 2) explore individual areas for improvement; 3) relate their present and future classes to entering the world of work; and 4) develop flexibility for changes that may occur in the future. 4 cr.

498. OPTIONS IN VOCATIONAL/TECHNICAL AND ADULT EDUCATION SEMINAR
Discussion of current issues, problems, and research and development in vocational/technical and adult education. Students, faculty, and other personnel serve as discussion leaders. Required of vocational/technical and adult education majors and minors. 2 cr. (Fall semester only.)

500. OCCUPATIONAL COMPETENCY EXAMINATION AND EVALUATION
Examination and/or evaluation to determine the level of competency within an occupation. Restricted to vocational/technical and adult education majors. Prereq: permission. 0–30 cr. Cr/F.

525. CURRENT ISSUES IN AGRICULTURE AND NATURAL RESOURCES
Current issues in agriculture that affect the lives of people now and in the future. Biotechnology; the complex industry of agriculture; issues related to our natural resources such as acid rain, forest lands, and water supply. Presentations by guest lecturers. 1 cr.

550. INTRODUCTION TO VOCATIONAL/TECHNICAL AND ADULT EDUCATION
Principles on which vocational/technical and adult education is based. Includes historical and legislative development at both the state and federal levels with emphasis on current issues and problems. Required of majors and minors in vocational/technical and adult education. 4 cr.

630. DEVELOPMENT OF FOOD AND FIBER IN THIRD WORLD COUNTRIES
The world food situation and the role of agriculture and education in development of third world agrarian systems. Identification of constraints on food production, technology transfer, advantages and disadvantages of different agriculture systems, agricultural marketing, and career opportunities in international agriculture. Optional trip to United Nations over spring break. 3 cr.

650. MICROTEACHING
Organization and presentation of microlessons in a variety of educational settings. Preliminary experience and practice in communications. Variables of classroom and extension teaching under controlled conditions. Videotaping for immediate feedback. Substitutes for Educ 703. Required of majors and minors in vocational/technical and adult education. Prereq: Educ 500 or permission. 1–4 cr.

666. TEACHING VOCATIONAL EDUCATION TO STUDENTS WITH SPECIAL NEEDS
The development of strategies for the identification and teaching of special needs students in vocational education. Topics covered include: legislation, identification of disadvantaged and handicapped learners, suggested teaching strategies, the development of Individual Vocational Education Programs (IVEPs), exemplary programs, current issues and problems, and other identified topics of student interests. Prereq: Educ 500 or permission. 4 cr.

695. INVESTIGATIONS IN VOCATIONAL/ TECHNICAL AND ADULT EDUCATION
A) Career Education; B) Secondary Education; C) Post-Secondary Education; D) Adult Education; E) Extension Education; F) Exemplary Education; G) Cooperative Education; H) Disadvantaged and Handicapped Education. An opportunity for undergraduates to address a special problem. Prereq: permission. May be repeated. 2–4 cr.

696. FIELD EXPERIENCE
Work with an agency, institution, or organization to gain technical and/or professional competence not otherwise available. Student plans experience with departmental adviser. Credit approval subject to recommendation of faculty members and performance of student. Prereq: permission. 2–16 cr.

700. WORKSHOPS IN VOCATIONAL/ TECHNICAL AND ADULT EDUCATION
Modularized instruction of in-service education. Focus will vary with the needs of the student. May be repeated up to 8 credits. 1–2 cr.

752. YOUTH ORGANIZATIONS
A) Organizational Development: development and guidance of youth organizations; parliamentary procedure, development of programs and activities, and identification of youth needs and interests. Required of all students seeking agricultural education teacher certification and as a prerequisite for B, C, and D. 2 cr.
B) FFA/SOEP (Future Farmers of America/Supervised Occupational Experience Programs for high school youth): required of all students seeking agricultural education teacher certification. 2 cr.
C) VICA (Vocational Industrial Clubs of America): required of those students seeking trade and industry teacher certification. 1 cr.
D) 4-H Youth Development: available to those students interested in extension education. 1 cr.

783. CONDUCTING AND SUPERVISING ADULT EDUCATION PROGRAMS
Analysis of traditional and nontraditional adult education programs; development of strategies of program planning, instruction, evaluation, and supervision. 4 cr.

791. PLANNING FOR TEACHING
Organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, function of consulting committees, working with youth groups, program evaluation. Course scheduled concurrently with Educ 694. Prereq: Microteaching. 4 cr.

794. ISSUES IN VOCATIONAL CURRICULUM FOR SPECIAL LEARNERS
Contemporary issues in vocational/special education; provides vocational educators with skills needed to meet the special learning needs associated with disadvantaged and handicapped learners. Encompasses development and modification of curriculum to meet the needs of individuals with specific disabilities. 4 cr.

796. INVESTIGATIONS IN VOCATIONAL/ TECHNICAL AND ADULT EDUCATION
A) Career Education; B) Secondary Education; C) Post-Secondary Education; D) Adult Education; E) Extension Education; F) Exemplary Programs; G) Cooperative Education Programs; H) Disadvantaged and Handicapped Education Programs. Student-selected problems in one of the areas listed. Elective after consultation with the instructor. Hours to be arranged. May be repeated. 2–4 cr.

Agricultural Mechanization

451. METAL WORK I
Arc and oxyacetylene welding and basic metal work. The knowledge needed to select materials, tools, and equipment; and development of skills to perform basic metal work. Lab. 3 cr.

452. METAL WORK II
Advanced arc and oxyacetylene and basic GMAW and GTAW welding. Topics include vertical and overhead welding and the joining of common metals other than mild steel. Prereq: Metal Work I; permission. Lab. 3 cr.

461. INTERNAL COMBUSTION ENGINES, PRINCIPLES AND MAINTENANCE
Internal combustion engines and their components with emphasis on how they function, preventive maintenance, and troubleshotting. Prereq: Permission. Lab. 3 cr.

462. INTERNAL COMBUSTION ENGINES, REPAIR AND OVERHAUL
Principles and techniques of engine overhaul. Each student is required to provide and overhaul, to factory specifications, at least one 4-stroke cycle engine. Prereq: Internal Combustion Engines, Principles and Maintenance; permission. Lab. 3 cr.

470. RESIDENTIAL ELECTRICITY
Electrical principles, laws, and installation with emphasis on the National Electrical Code. Prereq: permission. Lab. 3 cr.

475. BASIC CARPENTRY
Fundamentals of basic carpentry with emphasis on residential carpentry. Each student is required to plan and construct an approved project. Prereq: permission. Lab. 3 cr.

Women's Studies (W S)

(For program description, see page 26.)

COORDINATOR: Cathryn Adamsky

401. INTRODUCTION TO WOMEN'S STUDIES
Interdisciplinary survey of the major areas of women's studies; women's history, cross-cultural perspectives, women in literature, psychology of women, etc. Basic principles and concepts fundamental to more advanced women's studies research. Topics vary. Required for minor. 4 cr.

595. SPECIAL TOPICS IN WOMEN'S STUDIES
In-depth study of topics not covered in regular course offerings. Prereq: permission. 1–4 cr.

795. INDEPENDENT STUDY
For advanced students who have the preparation to carry out an individual project of supervised research on a specific women's studies topic. Preparation should include W S 401 or equivalent, and/or other women's studies courses. Prereq: permission of instructor and women's studies coordinator. Barring duplication of topic, may be repeated for a maximum of 8 cr. 1–4 cr.

796. ADVANCED TOPICS IN WOMEN'S STUDIES
Advanced or specialized topics not normally covered in regular course offerings. May be repeated, but not in duplicate areas. Prereq: permission. 4 cr.

798. COLLOQUIUM IN WOMEN'S STUDIES
Intensive study of specialized topic for advanced students. Topics vary with instructor. Prereq: permission. Preference given to women's studies minors who have completed 12 W S credits. Required for W S minors. Barring duplication of topic, may be repeated for credit. 1–4 cr.

Wildlife Management

(See Forest Resources.)

Zoology (Zool)

(For program description, see page 37.)

CHAIRPERSON: John E. Foret
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ASSOCIATE PROFESSORS: John E. Foret, Edward N. Francq, James F. Haney, James T. Taylor, Charles W. Walker, Winsor H. Watson III
ASSISTANT PROFESSORS: W. Huntting Howell, Stacia A. Sower

412. PRINCIPLES OF ZOOLOGY
Concepts of animal biology, introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Intended principally for majors in the biological sciences. Lab. 4 cr.

503. INTRODUCTION TO MARINE BIOLOGY
A lecture course emphasizing the organization of marine biological communities. Various marine environments—pelagic, benthic, temperate, tropical—and their characteristic communities. Major emphasis on the approaches (e.g., analysis of energy flow and predator-prey interactions) used to analyze marine communities as well as the sampling techniques employed for each approach and the characteristic habitat type. Three lectures, one discussion section/week. Prereq: Zool 412. 4 cr.

507-508. HUMAN ANATOMY AND PHYSIOLOGY
All systems in human body. Laboratories: a dissection of preserved cats and experiments with living tissues. Lab fee $5 per semester. (Students may not receive credit for both Zool 507-508 and Zool 519.) 4 cr.

518. VERTEBRATE MORPHOLOGY
Basic morphological features of vertebrates. Structure of the major systems at macroscopic and microscopic levels. Prereq: Zool 412. Lab. 5 cr.

519. COMPARATIVE ANIMAL PHYSIOLOGY
Principles and comparative function of cell, organ, and system levels of animal respiration, circulation, fluid regulation, energetics, coordination, and neuroendocrine mechanisms. Prereq: Zool 518 or 528; or equivalent; Chem 403-404. Lab. 4 cr.

528. INTRODUCTORY INVERTEBRATE ZOOLOGY
Lecture and laboratory survey of invertebrate phyla; systematic morphology, phylogeny, and natural history. Prereq: Zool 412. Lab. 4 cr.

542. ORNITHOLOGY
Identification and biology of birds, especially those of northeastern United States. Field trips, laboratory, and lectures. Prereq: one semester of biology. 4 cr.

560. ANATOMY AND BEHAVIOR OF THE GULL
Daily lectures; lecture demonstrations, laboratories, and field work. Functional anatomy of all organ systems, with emphasis on sensory, nervous, digestive, and respiratory systems. The large nesting colonies of two species of gulls on Appledore Island will be used to demonstrate territoriality, aggression, mating, and other basic patterns of gull behavior. Prereq: one course in college level biology. Staff. 1 cr. Cr/F. (Summer only.)

596. INTRODUCTION TO DESERT MOUNTAIN ECOLOGY
Field comparisons of plant and animal communities in habitats ranging from Chihuahuan desert through spruce/fir forests. Offered in the Chiricahua Mountains of southeast Arizona. Travel and living expense. Interested students should contact instructor in September. Prereq: permission. 2 cr. (Winters only, alternate years.)

604. PRINCIPLES OF GENETICS
Chemical and physical basis of inheritance; genes and chromosomes as units of mutation; genes in populations. Prereq: basic laboratory course in biological sciences. Organic chemistry and college math or statistics suggested. (Offered as PlSc 604 alternate semester.) Students may not receive credit for both Biol 404 and Zool 604. 4 cr.

629. DEVELOPMENTAL BIOLOGY OF THE VERTEBRATES
Principles of animal development including metamorphosis, regeneration, and aging in selected vertebrates. Prereq: Zool 518, 519, and 604. Lab. 4 cr.

674. FIELD MARINE SCIENCE
Daily lectures; laboratory and field work. Offered at the Isles of Shoals in cooperation with Cornell University. An initial overview of the marine sciences, emphasizing living material in natural habitats; biology of intertidal plants and animals; biological oceanography; ichthyology; and fisheries. Also introductory physical and chemical oceanography, marine geology, marine ecology, and the effects of human activity on the marine environment. Prereq: at least a full year of college biology. 6 cr. (Summer only.)

704. COMPARATIVE ENDOCRINOLOGY
Endocrine organs; relationship to control of the internal environment, growth, development, and adaptation to external environment. Prereq: Zool 518; Zool 519; organic chemistry. 4 cr.

705. TECHNIQUES IN ENDOCRINOLOGY
Application of modern laboratory techniques to study of hormonal and molecular mechanisms in the endocrine system. Prereq: Zool 704 or ANSc 701 or Bchm 751, 752, 753, 754, and permission. (Also offered as Bchm 705.) Lab. 4 cr.

707. HUMAN GENETICS
Inheritance patterns; gene and chromosome mutation rates and effects; linkage and gene frequency. Prereq: Zool 604 or equivalent; /or permission. 4 cr. (Not offered every year.)

709. ENVIRONMENTAL PHYSIOLOGY OF ANIMALS
Animals' responses to natural changes or extremes of the physical environment. Synthesis of basic concepts from ecology and physiology for students with background in these areas. Emphasis on adaptation of animals to major environmental parameters such as nutrient levels, light, temperature, ionic environment, etc., as well as temporal (seasonal, daily) changes in these factors. Examples from several levels of organization including biofeedback mechanisms. Prereq: Biol 541; Zool 519;/ or equivalent. 4 cr. (Not offered every year.)

711. NATURAL HISTORY OF COLD-BLOODED VERTEBRATES
Classes of poikilothermic vertebrates; their habitats, and life histories in eastern North America. Prereq: general zoology; Zool 518. Lab. 4 cr. (Alternate years.)

712. MAMMALOGY
Origins, diversification, reproduction, ecology, behavior of mammals. Identification of local forms. Prereq: Zool 412. Lab. 4 cr.

713. ANIMAL BEHAVIOR
Individual and social behavior. The role of anatomy, physiology, ecology, and prior experience. Techniques and practical application. Prereq: one year of zoology. Lab. 4 cr.

717. GENERAL LIMNOLOGY
Special relationships of freshwater organisms to the chemical, physical, and biological aspects of the aquatic environment. Factors regulating the distribution of organisms and primary and secondary productivity of lake habitats. Prereq: Biol 541 or equivalent. 4 cr.

719. FIELD LIMNOLOGY
Freshwater ecology examined through laboratory exercises with freshwater habitats. Methods to study freshwater lakes; interpretation of data. Seminars and occasional Saturday field trips. Prereq: present or prior enrollment in Bot 717, Zool 717, or equivalent; permission. 4 cr.

720. FIELD MARINE SCIENCE FOR TEACHERS
Primarily for teachers grades 6 through 12, but open to others. Overview of living marine organisms (algae, invertebrates, fishes, marine mammals, and shore birds) in their natural environments. Also such topics as coastal zone problems, marine fisheries, economics of marine organisms, and the educational resources of the marine environment. Field work. Offered at the Isles of Shoals (Shoals Marine Laboratory) in cooperation with Cornell University. Three lectures and two labs or field trips per day. Prereq: college-level introductory biology. 1 cr. (Summer only.)

721. PARASITOLOGY
Introduction to the more important parasites causing disease in humans and animals. Living materials will be used as much as possible. Prereq: one year of zoology. Lab. 4 cr. (Not offered every year.)

723. MOLECULAR BIOLOGY OF THE CELL
Examination of dynamic interrelationships between cellular structure and function at molecular level. Viral, prokaryotic, and eukaryotic models are used to illustrate molecular regulatory mechanisms underlying biological complexity. Recent advances are presented against a background of fundamental concepts. Emphasis on normal and impaired cellular differentiation, growth, interphase function, and proliferation. Also considered are the coupling of energy to cellular processes, the role of bioelectricity, and intrinsic and extrinsic chemical messengers. Prereq: organic chemistry. Recommended: developmental or cell biology (Zool 629, 728, Bot 632), biochemistry or physiology (Zool 519 or ANSc 717). 4 cr.

724. LABORATORY IN CELL BIOLOGY
Complements class material and stresses the use of modern research tools in addressing fundamental questions about the biology of the cell. Immunochemical techniques, traditional and innovative applications of electron and light microscopy, bioassay, cell culture and fractionation, and electrophysiology. Coreq: Zool 723. 2 cr.

728. DEVELOPMENTAL BIOLOGY OF THE INVERTEBRATES
Principles of animal development. Cellular processing of developmental information. Reproduction and development in the invertebrates. Prereq: Zool 412 or 528. Lab. 4 cr.

730. VERTEBRATE HISTOLOGY
Microscopic anatomy of vertebrate tissues and organs at the light microscope level; emphasis on mammalian histology; some comparative study of lower vertebrates. Prereq: Zool 508 or 518, or equivalent. Lab. 4 cr.

732. SOIL ZOOLOGY
Faunal communities of terrestrial soils, their ecology and natural history. Effects of animal activities on soil processes and composition. Collection, extraction, and study methods. Independent projects. Prereq: Biol 541 or equivalent; permission. 4 cr. (Not offered every year.)

751. ADAPTATIONS OF MARINE ORGANISMS
Ecological physiology of selected algae and invertebrates from the Gulf of Maine. Offered at the Shoals Marine Lab (Isles of Shoals) in cooperation with Cornell University. Prereq: field marine science, plant or animal physiology, physiological ecology; understanding of chemical quantitative methods and analysis. 4 cr. (Summer only.)

753. MARINE VERTEBRATES
Lectures, laboratories, and field work on the systematics, ecology, and physiology of fishes, marine reptiles, marine birds, and marine mammals of the Gulf of Maine. Offered at the Shoals Marine Lab (Isles of Shoals) in cooperation with Cornell University. Prereq: field marine science or vertebrate biology. 4 cr. (Summer only.)

772. FISHERIES BIOLOGY
Information and techniques used by fisheries biologists. Emphasis on fish life history, ecology, and economics as related to management techniques. Prereq: Zool 711 or equivalent; permission. Lab. 4 cr. (Alternate years.)

775. INVERTEBRATE EMBRYOLOGY
Comparative study of reproduction and early development in selected invertebrates, providing a classical approach to morphology of gonads, fertilization, cleavage, gastrulation, and formation of larvae. Prereq: field marine sci (UNH), Biol Sci. 364 (Cornell), or invertebrate zoology. Offered at the Shoals Marine Lab (Isles of Shoals) in cooperation with Cornell University. 4 cr. (Summer only; not offered every year.)

777. INTRODUCTION TO NEUROBIOLOGY
A survey of fundamental concepts and recent discoveries in neurobiology. Topics include: structure and function of neurons, development, cellular basis of behavior (sensory and motor systems), neuropharmacology, and neural plasticity (learning). Prereq: Zool 412 or permission. 4 cr.

791, 792. ADVANCED STUDIES IN ZOOLOGY
A) Marine Ecology; B) Stream Ecology; C) Freshwater Zooplankton Ecology; D) Population Ecology; E) Advanced Invertebrate Zoology; F) Protozoology; G) Comparative Physiology; H) Concepts and Techniques in Reproductive Biology; I) Comparative Neurophysiology; J) Morphogenesis. Graduate-level courses open to advanced undergraduates wishing a more detailed treatment of a field. Limited enrollment. Research-oriented with outside readings primarily from the original scientific literature. Enrollment by permission of instructor only; priority given to graduate students. 4 cr.

795, 796. SPECIAL PROBLEMS IN ZOOLOGY
A) Animal Behavior; B) Developmental Biology; C) Ecology; D) Electron Microscopy; E) Endocrinology; F) Evolution; G) Genetics; H) Histology; I) History of Biology; J) Invertebrate Biology; K) Parasitology; L) Physiology; M) Protozoology; N) Teaching Practices; O) Underwater Research; P) Vertebrate Biology; Q) Biological Techniques. Students may elect one or more sections for advanced study. Reading, laboratory work, organized seminars, conferences. Prereq: permission. 1–4 cr.

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Keene, N.H. (ex officio)

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Director of Admissions

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Faculty

(with date of appointment)

Abeles, Sigmund M. (1970)
Professor of the Arts; A.B., University of South Carolina, 1955; M.F.A., Columbia University, 1957.

Adamovich, Frank W. (1968)
Associate Professor and Documents Librarian; B.S., Fitchburg State College, 1960; M.S., Simmons College, 1968.

Adams, Robert L. A. (1967)
Associate Professor of Geography; B.A., Williams College, 1961; M.A., Clark University, 1966; Ph.D., ibid., 1971.

Adamsky, Cathryn (1981)
Associate Professor of Women's Studies; B.A., Clark University, 1955; Ph.D., University of Rochester, 1959.

Aikins, Janet (1979)
Associate Professor of English; B.A., Grinnell College, 1972; M.S., University of Chicago, 1973; Ph.D., ibid., 1980.

Alonzo, Roy S. (1969)
Thompson School Professor of Food Services Management; B.S., Boston University, 1953; M.B.A., Western New England College, 1961; Ed.D., Nova University, 1978.

Amell, Alexander R. (1955)
Professor of Chemistry; B.S., University of Massachusetts at Amherst, 1947; Ph.D., University of Wisconsin at Madison, 1950.

Amsden, Katherine (1967)
Associate Professor of Physical Education; A.B., Sweet Briar College, 1953; M.S., Smith College, 1956; Ph.D., University of Southern California, 1967.

Andersen, Kenneth K. (1960)
Professor of Chemistry; B.S., Rutgers, the State University of New Jersey, 1955; Ph.D., University of Minnesota, 1959.

Anderson, Franz E. (1967)
Professor of Geology; B.A., Ohio Wesleyan University, 1960; M.A., Northwestern University, 1962; Ph.D., University of Washington, 1967.

Andrew, David S. (1976)
Associate Professor of the Arts; B.A., University of Michigan at Ann Arbor, 1965; M.A., ibid., 1968; Ph.D., Washington University, 1977.

Andrew, Michael D. (1966)
Professor of Education; B.S., Cornell University, 1960; A.M.T., Harvard University, 1961; Ed.D., ibid., 1969.

Angus, Ian (1985)
Faculty in Residence, Assistant Professor of Theater and Communication; B.A., University of Waterloo, 1971; M.A., ibid., 1973; Ph.D., York University, 1980.

Annis, William H. (1962)
Professor of Occupational Education; B.S., University of Maine at Orono, 1951; M.Agri.Ed., University of New Hampshire, 1959; Ed.D., Cornell University, 1961.

Antonak, Richard F. (1975)
Associate Professor of Education; B.A., Rutgers, the State University of New Jersey, 1969; M.Ed., Temple University, 1970; Ed.D., ibid., 1975.

Antosiewicz, Rose T. (1970)
Associate Professor of Italian and Humanities; A.B., Brown University, 1954; Ph.D., University of California at Los Angeles, 1971.

Arnoldy, Roger L. (1967)
Director, Space Science Center, Interim Director of the Institute for the Study of Earth, Oceans, and Space, and Professor of Physics; B.S., St. Mary's College, 1956; M.S., University of Minnesota, 1959; Ph.D., ibid., 1962.

Aronson, Carol (1980)
Assistant Professor of the Arts; B.F.A., Boston University, 1963; M.A., University of Chicago, 1965.

Asbell, Mary Lou (1982)
Adjunct Clinical Instructor of Nursing; Diploma, Concord Hospital School of Nursing, 1972; B.G.S., University of New Hampshire, 1978; M.S., University of Southern Maine, 1983.

Ashley, Charles H. (1969)
Associate Professor of Education; A.B., Dartmouth College, 1957; M.Ed., University of New Hampshire, 1960; Ed.D., Boston University, 1969.

Austin, Noel F. (1983)
(Colonel, U.S. Air Force) Professor of Aerospace Studies; B.A., Bowdoin College, 1961; M.Ed., Duquesne University, 1970.

Averner, Maurice M. (1981)
Research Associate Professor of Complex Systems; B.S., Brooklyn College, City University of New York, 1957; Ph.D., Brandeis University, 1964; M.P.H., University of California at Berkeley, 1977; J.D., Golden Gate University, 1982.

†Baber, Kristine M. (1984)
Assistant Professor of Family and Consumer Studies; B.A., Southern Illinois University at Carbondale, 1970; M.A., University of Connecticut, 1981; Ph.D., ibid., 1983.

Baker, Alan L. (1972)
Associate Professor of Botany; B.A., State University of New York at Binghamton, 1965; Ph.D., University of Minnesota, 1973.

Baker, Kathleen Kromer (1985)
Adjunct Assistant Professor of Botany; B.S., University of Minnesota, 1964; M.S., ibid., 1967; Ph.D., ibid., 1977.

Bakitas, Marie A. (1984)
Adjunct Assistant Professor of Nursing; A.D.N., University of Bridgeport, 1977; B.S.N., ibid., 1980; M.S.N., Boston University, 1983.

Balderacchi, Arthur E. (1965)
Associate Professor of the Arts; A.B., Duke University, 1960; M.F.A., University of Georgia at Athens, 1965.

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* Indicates time devoted to Cooperative Extension Service
† Indicates time devoted to Agricultural Experiment Station

Note: This catalog reflects the faculty listing as of the beginning of the fall term, 1985.

Baldwin, Kenneth C. (1982)
Assistant Professor of Mechanical Engineering; B.S.M.E., Northeastern University, 1973; M.S.M.E., University of New Hampshie, 1977; Ph.D., University of Rhode Island, 1982.

Ballestero, Thomas P. (1983)
Assistant Professor of Civil Engineering; B.S.C.E., Pennsylvania State University, 1975; M.S.C.E., ibid., 1977; Ph.D., Colorado State University, 1981.

Balling, L. Christian (1967)
Professor of Physics; B.A., Oberlin College, 1960; M.A., Harvard University, 1961; Ph.D., ibid., 1965.

Balomenos, Richard H. (1961)
Professor of Mathematics Education; B.S., United States Merchant Marine Academy, 1952; M.A., New York University, 1956; M.S., University of Notre Dame, 1961; Ed.D., Harvard University, 1961.

Barlow, Robert F. (1962)
Professor of Economics and Administration; B.A., Colby College, 1950; M.A., Fletcher School of Law and Diplomacy, Tufts University, 1951; Ph.D., ibid., 1960.

Barnett, John H. (1983)
Associate Professor of Business Administration; B.A., Yale University, 1959; M.B.A., University of Virginia, 1961; D.B.A., University of Colorado at Boulder, 1978.

Barney, Dwight E. (1971)
Thompson School Associate Professor of Applied Animal Science; B.S., University of New Hampshire, 1966; M.S., ibid., 1971.

†Barrett, James P. (1962)
Professor of Forest Biometrics and Management; B.S., North Carolina State University, 1954; M.F., Duke University, 1958; Ph.D., ibid., 1962.

Barstow, Thomas R. (1965)
Assistant Professor of Physical Education; B.S., St. Lawrence University, 1961; M.Ed., ibid., 1965.

Batchelder, Gerald M. (1953)
Adjunct Associate Professor of Civil Engineering and Thompson School Professor of Civil Technology; B.S.C.E., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952.

Batcheller, Joseph D. (1944)
Professor of Theater and Communication; A.B., Carnegie Institute of Technology, 1936; A.M., University of Minnesota, 1938; Ph.D., ibid., 1942.

Bates, John E. (1984)
Instructor of Electrical Engineering; B.S., University of New Hampshire, 1977; M.S., ibid., 1979.

Batt, Carl E. (1985)
UNHM Instructor of Management; B.A., University of the Americas, 1965; M.A., Northwestern University, 1966; M.B.A., Boston University School of Management, 1983.

Bauer, Christopher F. (1981)
Assistant Professor of Chemistry; B.S., University of Notre Dame, 1974; M.S., University of Illinois at Urbana, 1976; Ph.D., Colorado State University, 1979.

Baum, William M. (1977)
Associate Professor of Psychology; A.B., Harvard College, 1961; Ph.D., Harvard University, 1966.

Bechtell, Homer F., Jr. (1966)
Professor of Mathematics; B.S., Grove City College, 1951; M.A., University of Wisconsin at Madison, 1956; Ph.D., ibid., 1963.

Becker, Rudy W. (1983)
(Captain, U.S. Air Force) Assistant Professor of Aerospace Studies; B.A., Rutgers University, 1974; M.S., University of Southern California, 1979.

Bedker, Patricia D. (1985)
Lecturer in Animal Science; B.S., University of Massachusetts at Amherst, 1974; M.S., University of New Hampshire, 1980; Ph.D., Cornell University, 1985.

†Befort, William A. (1982)
Assistant Professor of Remote Sensing; B.A., University of Minnesota, 1964; B.S., ibid., 1974; M.S., University of Idaho, 1977; Ph.D., ibid., 1983.

Benassi, Victor A. (1982)
Associate Professor of Psychology; B.S., California State College, 1969; M.A., Queen's College, 1973; Ph.D., City University of New York, 1974.

Bennett, Albert B., Jr. (1967)
Associate Professor of Mathematics; B.S., Maine Maritime Academy, 1954; B.S., University of Maine at Orono, 1958; M.A., ibid., 1959; Ed.D., University of Michigan at Ann Arbor, 1966.

Benoit, Jean (1983)
Assistant Professor of Civil Engineering; B.S., Ecole Polytechnique, University of Montreal, 1977; M.S., Stanford University, 1980; Ph.D., ibid., 1983.

Bergeron, R. Daniel (1974)
Associate Professor of Computer Science; Sc.B., Brown University, 1966; Ph.D., ibid., 1973.

†Berndtson, William E. (1979)
Associate Professor of Animal Science; B.S., University of Connecticut, 1966; Ph.D., Cornell University, 1971.

Bernier, Raymond J. (1967)
Assistant Professor and Technical Director of Theater and Communication; B.S., Southeastern Massachusetts University, 1958; M.Ed., Bridgewater State College, 1960; M.A., Smith College, 1967.

Bigglestone, Gail A. (1970)
Director of the Department of Women's Intercollegiate Athletics and Assistant Professor of Physical Education; B.S., University of New Hampshire, 1960; M.S., University of Massachusetts at Amherst, 1965.

Birch, Francis S. (1972)
Professor of Earth Sciences; A.B., Harvard University, 1958; M.S., University of Wisconsin at Madison, 1964; Ph.D., Princeton University, 1969.

Biringen, Sedat (1983)
Associate Professor of Mechanical Engineering; B.S., Robert College, 1968; M.S., ibid., 1970; Diploma, von Karmen Institute for Fluid Dynamics, West Germany, 1971; D.Sc., University of Brussels, Belgium, 1975.

Bise, Irene M. (1984)
Adjunct Assistant Professor of Nursing; Diploma, St. Vincent Hospital, 1958; B.S.N., Catholic University of America, 1963; M.S.N., ibid., 1970.

Bishop, Paul L. (1972)
Professor of Civil Engineering; B.S.C.E., Northeastern University, 1968; M.S.C.E., Purdue University, 1970; Ph.D., ibid., 1972.

Blackmer, Virginia A. (1984)
Adjunct Assistant Professor of Nursing; B.S.N., Fitchburg State College, 1977; M.S., Boston College, 1981.

Blakemore, Richard P. (1977)
Associate Professor of Microbiology; B.S., State University of New York at Albany, 1964; M.S., ibid., 1965; Ph.D., University of Massachusetts at Amherst, 1975.

Blanchard, Fletcher A., Jr. (1950)
Professor of Electrical Engineering and Associate Director of Engineering Design and Analysis Lab; B.S., Union College, 1948; M.S., Lehigh University, 1950.

Blanchard, Robert O. (1972)
Associate Dean of the College of Life Sciences and Agriculture and Professor of Plant Pathology; B.S., University of Maine at Gorham, 1964; M.Ed., University of Georgia at Athens, 1969; Ph.D., ibid., 1971.

Blount, Joseph P. (1985)
Assistant Professor of Psychology; B.A., Vanderbilt University, 1970; Ph.D., University of Minnesota, 1981.

Blount, Mary Ann Records (1982)
Assistant Professor of Communication Disorders; B.S., Ohio University, 1973; M.A., Western Michigan University, 1974; Ph.D., University of Minnesota, 1982.

Bobick, Melvin T. (1958)
Professor of Sociology; A.B., University of Illinois at Urbana, 1949; A.M., ibid., 1952; Ph.D., ibid., 1958.

Bocialetti, Eugene (1983)
Assistant Professor of Organizational Behavior; B.S., Fairfield University, 1969; Ph.D., Case Western Reserve University, 1982.

Boehm, Judith J. (1984)
Adjunct Assistant Professor of Nursing; B.S.N., Case Western Reserve University, 1966; M.S.N., University of Alabama, 1975.

†Bogle, A. Linn (1970)
Professor of Botany; B.S., University of Washington, 1958; M.S., ibid., 1961; Ph.D., University of Minnesota, 1968.

Bolian, Charles E. (1971)
Associate Professor of Anthropology; B.A., Mississippi State University, 1965; Ph.D., University of Illinois at Urbana, 1975.

Bonnice, William E. (1962)
Associate Professor of Mathematics; B.A.E., Syracuse University, 1951; M.S., University of Washington, 1960; Ph.D., ibid., 1962.

Borror, Arthur C. (1961)
Professor of Zoology; B.S., Ohio State University, 1956; M.S., ibid., 1958; Ph.D., Florida State University, 1961.

Bothner, Wallace A. (1967)
Professor of Geology; B.A., State University of New York at Binghamton, 1963; Ph.D., University of Wyoming, 1967.

Boudette, Eugene L. (1985)
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Enrollment Statistics — Fall Semester

	1982-1983	1983-1984	1984–85 (Men/Women—Total)	1985–86
Freshmen	1068/1346— 2414	1070/1337— 2407	1096/1312— 2408	1087/1364— 2451
Sophomores	992/1242— 2234	1007/1275— 2282	1047/1245— 2292	953/1239— 2192
Juniors	955/1116— 2071	948/1137— 2085	939/1204— 2143	973/1127— 2100
Seniors	1062/1344— 2406	917/1174— 2091	994/1226— 2220	1003/1248— 2251
1st Year—T.S.A.S.	188/ 128— 316	153/ 146— 299	170/ 147— 317	211/ 141— 352
2nd Year—T.S.A.S.	93/ 72— 165	87/ 60— 147	77/ 60— 137	74/ 42— 116
D.C.E.—A.A.	39/ 68— 107	45/ 52— 97	68/ 61— 129	52/ 68— 120
Graduates—Master's	383/ 349— 732	361/ 389— 750	337/ 414— 751	334/ 420— 754
Graduates—Doctorates	110/ 67— 177	117/ 68— 185	135/ 80— 215	135/ 88— 223
Total	4890/5732—10622	4711/5638—10343	4863/5749—10612	4822/5737—10559
Continuing Education*	630/ 811— 1441	664/ 870— 1534	660/ 928— 1588	608/1015— 1623
Summer Session	1506/1796— 3302	1354/1699— 3053	1301/1704— 3005	1214/1700— 2914

		1982-1983	1983-1984	1984-1985	1985-1986	1982-1983	1983-1984	1984-1985	1985-1986
Baccalaureate Curricula		Life Sciences and Agriculture				Liberal Arts			
	Senior	392	300	316	298	811	690	767	769
	Junior	336	298	294	259	834	860	835	902
	Sophomore	322	295	272	201	1078	1091	1083	1071
	Freshman	320	313	254	233	1049	1063	1023	1184
	Total	1370	1206	1136	991	3772	3704	3708	3926
		Engineering & Physical Sciences							
	Senior	456	400	416	483				
	Junior	359	386	423	399				
	Sophomore	355	394	404	400				
	Freshman	495	471	528	478				
	Total	1665	1651	1771	1760				
		Whittemore School				Health Studies			
	Senior	426	383	386	387	321	318	335	314
	Junior	282	286	319	288	260	255	272	252
	Sophomore	234	266	293	268	245	266	240	252
	Freshman	298	319	334	315	252	241	269	241
	Total	1240	1254	1332	1258	1078	1050	1116	1059
Graduate Curricula		Graduate School							
	†Master's	732	750	751	754				
	Doctorates	177	185	215	223				
	Total	909	935	966	977				
Associate Degree Curricula		Thompson School				Division of Continuing Education			
	2nd Year	165	147	137	116				
	1st Year	316	299	317	352				
	Total	481	446	454	468	107	97	129	120

* Credit courses

† Does not include Institutes and Special Summer Session in Technology. Includes Certificates of Advanced Graduate Study. 1985-86 figures also include 2 students coded as "other."

n.a. not available

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Bulletin of the
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